Context
Economic growth and poverty reduction in Ethiopia is dependent on an agricultural sector that employs more than 85 percent of the labor force. The primary farming activity is the production of cereals for domestic consumption, especially wheat, maize, teff, and sorghum. Agriculture is almost entirely rainfed with only 1.4 percent of total cropped area irrigated, less than half of the African average. 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. Three out of five Ethiopians live in parts of the country that are endowed with only 20 percent of total water resources (World Bank 2005d). In a drought year, household farm production may decline by up to 90 percent (World Bank 2005a). The long-term impact of these consumption shortfalls can be severe. Severe drought is also a source of lower long-run growth of household income: according to a 1995 estimate, households in areas hard-hit by the 1984/85 famine were 16 percent poorer than those in moderately affected households (Dercon, 2000).

In Ethiopia, deficit rainfall during either of the two rainfall periods is the most indicative proxy for changes in yields and farm output. Both seasons are usually not reliable, are relatively short, and even small deviations in rainfall can cause complete production failures. Production risk is compounded by volatility and uncertainty in the price of staple foods, which is largely caused by climatic shocks and compounded by weak domestic markets and lack of integration with world food markets due to poor infrastructure and a poorly timed influx of foreign food aid (World Bank, 2005a).

Variability in yields due to weather shocks has a negative impact on farmers’ incentives. Producers are less likely to appropriately use yield-enhancing inputs, as this is unprofitable in poor-rainfall years. Additionally, weather risk, among other risk factors, also makes it extremely difficult for farmers to obtain credit for production inputs which results in farmers remaining reliant on low risk, low yield production patterns and traditional coping mechanisms. But the covariant nature of weather risks makes it difficult to rely on informal channels such as family and friends in times of rain shortfall because it is likely that if a farmer is facing hardship, his neighbor is also. Ethiopian farmers’ high level of exposure to risk and its consequences necessitates a focus on a range of policy areas to reduce risks as a core part of a growth-oriented strategy. A comprehensive strategy must include formal mechanisms both to reduce risk and help households manage risk, including i) risk reduction; ii) risk management; and iii) reducing vulnerability.
This note focuses on one of the available instruments to address the risk management component of this strategy. While there are a wide variety of activities that can help manage risk, insurance is one approach that should be considered. More specifically this note looks at using index-based weather insurance, which uses measurable weather events as a proxy for losses, as one household risk management alternative by delivering insurance efficiently and cost effectively.

**Approach**

Traditional publicly-supported and commercial crop insurance has, in most cases, encountered severe problems particularly when delivered to small holders and, in the case of public sector programs, has largely been viewed as ineffective and burdensome. Causes of its failure range from ad hoc disaster response by government due to inconsistent insurance “triggers,” to a variety of challenges (e.g., asymmetric information, adverse selection, moral hazard, etc.) associated with all-risk or multi-peril insurance. Because of the challenges associated with introducing a traditional crop insurance program for smallholders, expanding on a previous feasibility study on index-based products in Ethiopia, the World Bank’s Commodity Risk Management Group (CRMG) explored the development and implementation of weather insurance for farmers by conducting a pilot program. It was developed during 2005 and 2006 and resulted in transactions in March of 2006.

CRMG’s initial research focused on the three areas, based on its previous experience, that it believed were the three primary prerequisites for implementing an index-based weather insurance program in Ethiopia, including 1) weather data and analysis of where index-based insurance might be feasible, 2) a risk taker to write or intermediate the contract, and 3) a company or institution to deliver the contract to farmers.

**Data.** Historical weather data is the primary pre-requisite for designing an index-based weather insurance contract. In Ethiopia there were 600 weather stations that gather weather data. These stations were controlled and monitored by the National Meteorological Agency (NMA) in Addis Ababa. Of these, only 17 were 24-hour synoptic (SYNOP) stations, which report every three hours to WMO Global Telecommunication System (GTS), when communication permits; an additional 50–60 stations reported daily to the Addis Ababa office.¹

Due to lack of data and limited capacity for reporting the data, there were a limited number of stations that could be used to develop insurance products for communities in Ethiopia. It can be assumed that for stations that are missing more than 20 percent of data from the past thirty years that the insurance premiums, which take into account the uncertainty missing data creates, would be prohibitively high to justify an insurance program. By using station data as a means to test for inclusion in the program, only 33 stations which have less than 20 percent missing data, and 31 that have less than 10 percent missing, could be

¹ These are Class 1 stations: fully equipped meteorological observing stations recording pressure, temperature, relative humidity, wind speed and direction, rainfall, evaporation and soil temperature every three hours from 06.00 to 18.00.
used to inform weather insurance.

Risk Taker. Another key prerequisite is an efficient risk transfer mechanism. While there are markets that trade weather risk in developed countries, these markets are either inaccessible or inappropriate to manage weather risk in developing countries. Therefore, it was necessary to identify a local insurance company and/or an international counterparty that would be willing to write these contracts or intermediate the risk to these markets. In order to implement an index-based insurance program, Ethiopian law required the participation of at least one insurer, even if it did not ultimately market the product to the client.

At the time of the pilot, the Ethiopian insurance sector had minimal experience with agricultural insurance and lacked the technical know-how to develop index-based products. Despite a lack of familiarity with the product, when looking for potential partners for the pilot, three insurance companies showed interest in index-based weather insurance. One of these companies was the state owned Ethiopian Insurance Corporation (EIC) that had been researching new products to market in the agricultural sector. Two private companies also showed interest, but had little outreach in the rural sector and less interest in the product then EIC (since this work was initiated in 2006, Nyala Insurance has begun building expertise in index-based weather insurance). Ultimately, EIC’s high level of interest in the product, mandate by the government to look for agricultural insurance alternatives, and staffing capacity made it a natural “risk off-taker” for the pilot program.

Delivery Channel. The third prerequisite is an institution sufficiently imbedded in the agricultural sector to effectively deliver the product to a wide number of clients. Due to poor infrastructure and communications, it is extremely costly to develop a client base, particularly when that company has not been previously engaged in the rural sector. In order to minimize these costs it was necessary to identify an organization to market the insurance product by leveraging existing outreach to rural areas.

Because of their strong outreach to the rural sector and the greatest business incentive in becoming involved in the pilot, cooperatives were chosen to act as intermediaries and provide the product to prospective farmer clients. In Ethiopia, the development of cooperatives is being strongly encouraged by the government as a means to facilitate service delivery for marketing, processing, and extension and improve the ability of farmers to market their products. Cooperatives are most closely linked to farmers through existing marketing activities. The major constraint to working with cooperatives on this type of project is a lack of technical skills and expertise needed to manage the delivery of a new product. Financial institutions were also a natural candidate for this role, but at the time, the government employed a lending guarantee for fertilizer that minimized the incentives of banks to pursue weather risk management products.

Pilot Program
After gathering information regarding the initial prerequisites for the pilot program, EIC and CRMG worked together to develop a work plan, which included a number of steps:

i) identify potential pilot areas, crops, and delivery channels;
ii) carry out market research to determine the major risks and demand for insurance;
iii) design contracts to meet the needs of the farmers;
iv) test the contracts and different payout structures of the contracts;
v) finalize insurance arrangements and contractual agreements between participants in the pilot;
vi) provide technical training to the EIC and “train the trainers”;
vii) market the product to potential clients and establish contractual agreements between participants; and
viii) execute and monitor the contracts.

EIC selected two pilot areas, Alaba and Lemmo & Bilbilo, where they and potential clients (farmers and institutions) had interest in introducing a new product, there was medium-low exposure to drought risk which could be confirmed by yield data, and there was an NMA weather station with historical weather data. EIC worked with local cooperatives to market the products since cooperatives were engaged in service provision to farmers, including input supply, and credit and saving facilities. A participatory assessment was also carried out in those areas to gather information on how insurance would affect farmers’ livelihoods and investment behaviors, and small farmers’ demand and willingness to pay for weather insurance in the target areas.

The findings revealed that the relative importance of rain shortage events is quite different in the two kebeles in the Lemmo & Bilbilo woreda, pointing to the erratic nature of rainfall within a limited geographical area\(^2\). It also highlighted that farmers are dealing with many risks that are not covered by a weather insurance policy, but which could result in yield losses. Finally this analysis confirmed previous studies done in Ethiopia, showing that distress sale of assets (livestock in particular) is the most frequently adopted coping strategy when droughts occur that result in significant negative effects.

Based on information gathered in the participatory assessment and the general characteristics of the two woredas, EIC and CRMG designed contracts for maize and pepper in Alaba woreda and barley in Lemmo & Bilbilo woreda. EIC and CRMG aimed to design contracts with a weather index that most accurately predicted yield losses. Basic inputs of weather data, yield data, input from farmers, and agronomic information on the plant were invaluable to this process, as they were critical to determining how changes in the measurable weather variable or a weather event affect yield. Given the farmers’ expressed interest in a maize insurance product for deficit rainfall, and the relatively less significant impact of basis risk, EIC elected to work with the Alaba woreda for the pilot program.

Subsequently, EIC decided that the pilot would remain small and to retain the risk in country. In addition, EIC and CRMG discussed the pilot program and the new product with the insurance regulator, the National Bank of Ethiopia. The regulator agreed with the pilot and only requested to see the finalized insurance contract before it was implemented. Before the product could be introduced to the farmers, CRMG hosted a number of training

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\(^2\) The potential mismatch between the contract payout and the actual yield losses whereas the payout does not adequately indemnify the insured.
sessions with local and national EIC employees and a local agent from the Ministry of Agriculture. These training sessions aimed to “train the trainers” on the product and provide some guidance on marketing it to their potential clientele. EIC relied on these trainees and the cooperative leaders to market the products. The pilot resulted in a small transaction in which 28 farmers bought index-based insurance to protect against deficit rainfall for maize. After signing a memorandum of understanding with the local NMA office, EIC received weekly weather data from the local meteorological department.

Lessons Learned
While a pilot was implemented and a small group of farmers purchased the insurance contract, the greatest benefit of implementing the pilot was to highlight the challenges that would need to be overcome to make this pilot scalable and sustainable.

Data. While suitable data was found for a number of stations in Ethiopia, there is generally a lack of sufficient data for the development of weather insurance contracts on a large scale. In addition, the reporting capabilities for many existing stations were weak and would require improvements if these stations were to be used to underwrite contracts. Investment in new technology, cleaning of data, and upgrading of infrastructure is necessary to overcome these issues, but even with investments it would take a number of years to see improvements.

Delivery Channels. Identification of marketing agents for these products would require both capacity building for institutions and policy dialogue around input lending. For the pilot it proved difficult to identify an organization that had a sufficient balance of interest in the product, outreach to the farmers, and technical capacity to serve as the partner and market intermediary for these products. The relative weakness of the cooperatives proved an obstacle for marketing. Possible alternatives explored for this role included financial institutions, service providers for agricultural inputs, insurers, and other retail agents, but none of these potential partners had incentives or the ability to provide this service to farmers. The prime candidates for marketing this product were financial institutions, a solution which otherwise proved inappropriate because the current government guarantee for fertilizer credit minimizes incentives for banks to participate in this type of program. The general promotion of rural and agricultural credit markets would need to be improved to create a conducive environment for weather insurance products; without a general market for financial services, promotion would be challenging.

Other Issues. Two other less urgent issues that need attention are the need to involve a larger number of insurance companies and the need to build capacity around these instruments in the banking and insurance sector. For pilot implementation, it is necessary to have a risk taker willing to either hold the risk and/or intermediate the risk to the international risk markets through reinsurance agreements. EIC was willing to fill this role and provide the needed risk capacity for the pilot. If the pilot program had been larger, or in order to scale-up the program, it would be necessary to seek reinsurance and interest the international market. To do that, the size of the transactions would need to increase significantly and the integrity of the underlying data would become even more critical.
The work carried out by CRMG also indicated that additional capacity needs to be built within banks and insurance companies to carry out weather risk assessment and contract design. Banks are included here because they could utilize the risk assessment components of the contract design process to improve their credit risk analysis. Currently this assessment does not consider the quantitative impact of weather risk on lending. This type of initiative could allow banks to better assess the risks related to agricultural lending and potentially expand their portfolio in a managed and informed way. In addition, while EIC has gained a greater understanding of the products and can, on a limited basis, offer index-based products, their skills would need to be enhanced to design and offer these products on a larger scale. Because the other Ethiopian insurance companies in the market concentrate on a few standard insurance products, increasing their ability to offer or design these contracts would require significant training. This has changed in recent years as Nyala Insurance has begun building capacity in these products, but will still require greater investment and capacity building to prepare the market to scale-up weather risk management programs. Most of the contract design for the pilot was carried out by CRMG. Giving the insurance companies the facilities to undertake this process independently would improve the ability to offer products appropriate to their clients' risk.

Next Steps
Since 2006, EIC has considered offering a weather insurance contract. The subsequent year they offered a similar product to the same farmers and had minimal take-up, although the product was only offered to a few farmers. EIC would like to revise and revive the product and, as a result, has been conducting market research on potential opportunities. In addition, Nyala Insurance has begun exploring the idea of index-based weather insurance and has been conducting market research and program planning to offer a product to farmers. Finally Oxfam America is working to pilot weather insurance for farmers in their projects in the Tigray region of Ethiopia. All of these initiatives reflect the significant interest in Ethiopia in piloting weather risk management programs. The National Bank of Ethiopia also has a project (supported by the World Bank) to provide investments in activities that would support the necessary foundation to grow this market, including weather infrastructure, capacity building, and pilot programs.

The intention of the work carried out in 2006 was to identify those activities that were needed to provide fertile ground for the growth of an index-based weather risk management market for farmers in Ethiopia. As programs and pilots attempt to forge new risk management ground, it will become critical to support investment in capacity building, piloting, and weather infrastructure in order to facilitate market growth. These investments and additional policy work to reduce the disincentives for financial sector actors to participate (i.e., credit lending guarantees) are the critical groundwork to moving these activities beyond pilots programs and creating a robust market for weather insurance.