ENSO Business Interruption Index Insurance for Catastrophic Flooding in Piura, Peru

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This concept note describes an innovative risk transfer product being introduced by La Positiva (a Peruvian insurance company) with assistance from GlobalAgRisk, Inc. preliminary feasibility research in Peru was performed by GlobalAgRisk in 2005–2006 with support from USAID. Currently, GlobalAgRisk is seeking funding to advance this work from the Bill and Melinda Gates Foundation (BMGF). The insurance product will provide indemnities to financial institutions and other enterprises *before* a severe El Niño event emerges as indicated by an index of sea surface temperature (SST) in the Pacific Ocean. As will be more fully developed, the SST measure that is used is developed by the U.S. National Oceanic and Atmospheric Administration (NOAA) for the El Nino Southern Oscillation (ENSO). Research has demonstrated that ENSO measures from regions 1 and 2 (ENSO 1.2) provide a clear indicator of emerging problems in many regions of Peru. Our focus is on catastrophic flooding in Piura that is directly tied to extreme ENSO 1.2 values.

Unlike most forms of insurance, this insurance will pay *before* the catastrophe emerges using ENSO 1.2 values in advance of severe weather on the mainland. This is highly significant as it affords the opportunity to use indemnity payments for needed adjustments and adaptation strategies to mitigate the losses and serious disruptions that are likely to be encountered. This insurance will be ENSO Business Interruption Index Insurance (EBIII).

The three core sections of this concept note review the following:

1. The catastrophic weather risks in Piura associated with extreme sea surface temperatures
2. A description of the ENSO Business Interruption Index Insurance (EBIII)[1]
3. How lenders in Piura can use this insurance as a business interruption insurance leading to increased access and use of credit by smallholders

Two concept notes, that were developed in May, 2008, at the request of the Peruvian banking and insurance regulator — the Superintendencia de Banca, Seguros y AFP, República del Perú (SBS) — are included as appendixes. Appendix A reviews how the EBIII structure could also be used as a livelihoods insurance product for rural households that are vulnerable to the catastrophic effects of El Niño. At the moment however our focus is on developing this product for rural lenders and other risk aggregators (those in the agricultural value-chain, and potentially government agencies that must respond quickly to catastrophic flooding in Piura). Once the framework is established for providing the product to that market it will then be possible to expand the application of the insurance product to rural households. Appendix B provides some vision for how this form of insurance could be used as a warranty-like instrument by microfinance lenders in Peru. Used in this way, the provisioning requirements could change for these lenders. This would prove to be of high value. Of course, this is an issue that the lenders themselves would need to pursue with SBS directly.

[1] **Business interruption insurance** is insurance that provides protection for the loss of profits and continuing fixed expenses resulting from a break in commercial activities due to the occurrence of a specific peril or risk event.

El Niño, Catastrophic Flooding, and Associated Disruptions in Piura

The catastrophe of concern is extreme flooding that is directly tied to *extremely elevated* values of ENSO 1.2 — a severe El Niño event. Although there are many regions of Peru that are negatively affected by El Niño, the department of Piura in northern Peru is a good location to test this new form of weather index insurance as it is one of the areas that has experienced the most damage from torrential rainfall and flooding brought on by El Niño. The relationship between elevated ENSO 1.2 and catastrophic weather in Piura is very strong — extreme elevations in ENSO 1.2 will create catastrophic flooding.

Background on Piura

Piura is one of the most productive agricultural areas of Peru. The two important agricultural regions in Piura are situated along the two major rivers — Piura River and Chira River. As a consequence, a very high number of farm households are extremely vulnerable to either direct flooding or extreme rainfall during the primary growing season (January–April). Piura produces both export and domestic crops including cotton, rice, corn, and other grains, beans, coffee, and tropical fruits, as well as livestock. Agricultural production in Piura accounts for nearly 5 percent of the national gross domestic product (GDP) for agriculture, and represents 10 percent of GDP within Piura with a value of roughly USD 200 million (2007). The labor force in Piura totals about 685,000, with roughly 37 percent engaged in agriculture either as farmers or laborers (including livestock). About 93 percent of farmers farm less than 10 hectares of land, and 57 percent farm less than 3 hectares. Fifty-four percent of the population of 1.7 million is at or below the poverty line. Considering the different ways poverty can be defined, if both their income and their ability to fulfill their basic needs are considered, 70 percent of the population can be classified as living in poverty (INEI, 2007). Thus, there are likely many households who are highly vulnerable to falling into a poverty trap from a single catastrophic event. The majority of the poor are engaged in primary labor activities (e.g., agriculture, fishing, mining, and construction) that are susceptible to lost production when catastrophic rainfall and flooding occurs.

Rural Finance in Piura

Farmers in Piura have limited access to credit and most do not participate in an organized commodity chain. In survey work with farmers in Piura performed by Carolina Trivelli in 2006 and 2007, approximately 65 percent said they had access to credit and 28 percent of the sample used formal credit. Thus, a large percentage of those farmers who have access are not using it. Another 25 percent of the sample indicated that they had no access to credit. When disasters occur most households rely on friends or family in the community, or the sale of livestock to help cope with the lost production or other damage. However, these strategies are less effective when an entire community is affected, as is the case with El Niño events. The use of savings and credit to smooth cash flow problems is practically non-existent among smallholder farmers.

ENSO 1.2 and El Niño Trends for Piura

Our work with climate experts at Columbia University demonstrates that extreme flooding in the northern regions of Peru (the department of Piura) is directly tied to elevations in the ENSO 1.2 off the coast of Peru. Climate models demonstrate that major increases in ENSO 1.2 in the equatorial Pacific Ocean affect trade winds in a manner that creates extreme rainfall in Piura during the months of January through April. Warm Pacific trade winds blow across the western coast of Peru and meet cold air cascading down the Andes east of Piura. The meeting of these two air masses results in extreme and prolonged periods of rainfall. Some experts expect a severe El Niño to occur about 1 in 15 years. During the most recent two extreme events (1982–83 and 1997–98) rainfall was up to 40 times above normal for the January though April period. The flow of the

Piura River was 41 times above the median during the same time period for 1997–98, and 36 times above the median for 1982–83.

Two fundamental trends are very troublesome. First, data of the past 30 years raise concerns that El Niño events are growing more frequent and more severe. In fact of the 10 strongest El Niño events in the last 100 years, the four strongest events have occurred since 1980. Second, upstream deforestation is likely responsible for increased intensity of flooding. However, both trends suggest that catastrophic flooding events in Piura could be more frequent and more severe than in the past.

What Damage from El Niño Means for Piura

Devastation like what occurred with the 1997–98 El Niño is of enough concern without considering that conditions could be worse in the future due to more severe El Niño events and more runoff due to deforestation. While the 1997–98 El Niño had far reaching effects across Peru, Piura was one of the most heavily damaged regions due to heavy rainfall, flooding, and landslides. National Geographic reports that mosquitoes thrived in places where flood waters pooled, causing rampant malaria — some 30,000 cases in the Piura region alone, three times the average for its 1.5 million residents. Across Peru, over 200,000 hectares were destroyed, with nearly 11,000 hectares (or 15 percent of the farmland) destroyed in Piura. Agricultural production in the region was reduced by about one-third. The cotton crop was essentially totally destroyed. Many other crops also suffered extreme damage. The highest value losses occurred among high value export crops such as banana, papaya, asparagus, as well as rice and yellow corn. The value of agricultural losses, including crop losses, lost wages, and damage to irrigation infrastructure, accounted for 19% of the damage in Piura, was estimated to be in excess of USD 40 million.

Beyond the damage to crops and other livelihood strategies, the extreme flooding events of 1982–83 and 1997–98 destroyed or severely damaged public infrastructure such as roads, bridges, water reservoirs, and irrigation systems. The total estimate for damages across all sectors in Piura from the 1997–98 event was USD 200 million (Cruzado Silveri, 1999). The significant disruptions of basic transportation created problems for many types of trade. This, in turn, created cash flow and debt repayment problems for those financial institutions making loans to a wide range of small- and medium-size enterprises in these regions.

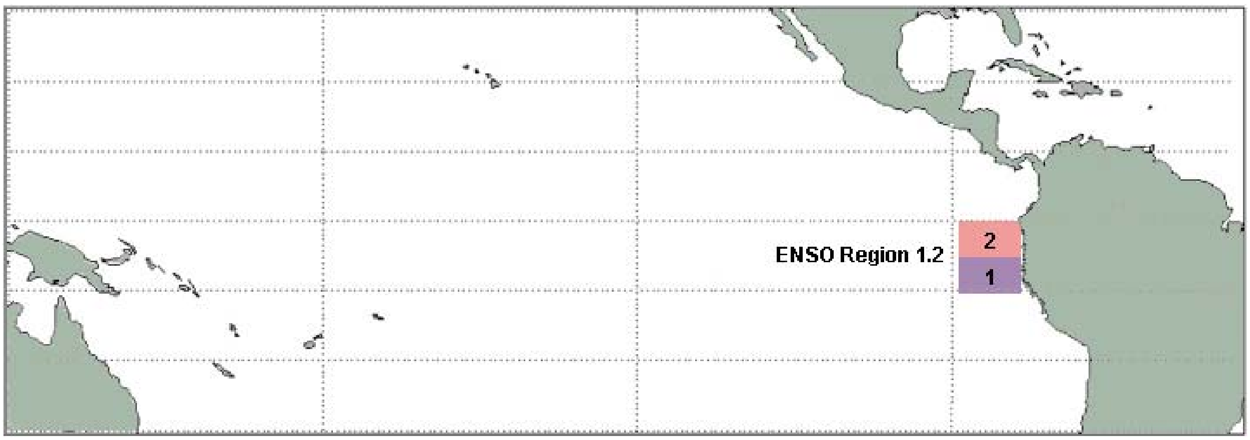
El Niño Index Business Interruption Insurance (EBIII)

Experts from the Peruvian ministry of agriculture (MINAG), SENAMHI, and INRENA, generally agree that the floods associated with major El Niño climatic events have been responsible for the greatest damage to agriculture in Piura over the past 50 years. The consequences of El Niño on the poor and on the rural economy in Piura provide the motivation for developing an insurance product that addresses this catastrophic risk.

Although extreme rainfall is the immediate cause of damage, rainfall insurance was determined to not be feasible. During our previous work in Peru, inspection of rainfall station data, as well as volume and flow data for the two major reservoirs that supply the major river valleys suggested that these data are unlikely to be useful for the design of a prototype risk-transfer product because the data series are short, sparse, and difficult to interpret. Furthermore, during the most extreme rainfall events several weather stations were put out of order by the severity of the flooding and rainfall. Attempting to capture these catastrophic events with weather station data is not feasible and would add significant complexity to product design.

We pursued the relationship between ENSO 1.2 and extreme rainfall and flooding events. By using data from the U.S. National Oceanic and Atmospheric Administration (NOAA),[2] this research confirmed that data from the ENSO 1.2 index could be used as a proxy for loss as the most extreme values capture the extreme flooding events. NOAA generates several composite indexes that correspond to different regions in the Pacific Ocean. Our analysis, in collaboration with climate experts from Columbia University and The Ohio State University demonstrates that El Niño flooding in Piura could be predicted using a composite of ENSO Regions 1 and 2, ENSO 1.2 (Figure 1). Technical experts at the MINAG were also in agreement that measurements from ENSO 1.2 provide ENSO indicators that are most highly correlated to extreme flooding in Piura.

Figure 1 The Composite El Niño Region 1.2[3]



Source: Authors

Developing the EBIII

We conclude from our previous work that an insurance contract could be developed based on the ENSO 1.2 measurements from a properly constructed ENSO 1.2 index. The clear advantage of such an insurance contract is that the measurement is fully transparent to all parties and is developed by an independent and objective third party source. Thus, the features of this index insurance are fully consistent with the major advantages of index insurance: that the contract can be made free from adverse selection and moral hazard. Based upon sound insurance principles and the potential high value for Peru, SBS approved the concept of EBIII in the fall of 2005. As will be clear below, to control adverse selection, the sales closing date for an insurance that will pay in early January, 2010, based on the average ENSO 1.2 values of November and December, 2009, must have a sales closing date of April 30, 2009. After April, the ENSO 1.2 values provide early forecasting information about the probability of an El Niño event that will occur in the following year (from January to April).

Work performed in January, 2009, demonstrates that the average ENSO 1.2 value for the months of November and December captures the extreme events with a very high confidence level *before the devastation begins*. Thus, it is possible to write an El Niño Insurance that can be effectively used to mitigate the problem

[2] The NOAA Physical Oceanography Division (PHOD) of the Atlantic Oceanographic and Meteorological Laboratory (AOML) provide the ENSO 1.2 data used for the development of this product.

[3] ENSO 1.2: delimited by 0°-5°S, 90°W-80°W and 5°S-10°S, 90°W-80°W, respectively

before it gets serious. This is a major innovation and highly significant. The correlation between ENSO 1.2 average from November to December and the ENSO 1.2 average from January to March is 91 percent when using the values that are above the median ENSO 1.2. The payout rates for a contract written using average ENSO 1.2 in November and December are nearly identical to a contract that would be written using ENSO 1.2 from January to March.

Targeting the Users

The EBIII will be written as a business interruption insurance policy that could be used by any of the lenders in Piura that will be exposed to extra costs when there will be catastrophic weather as indicated by the extreme ENSO 1.2 using the November to December average of the ENSO 1.2. Business interruption insurance is designed to compensate for lost profits or extra costs that occur as a result of the insurable event. The business interruption costs incurred can include the extra costs of finding capital during this extreme event, the losses incurred due to restructuring loans, and ultimately, the extra costs associated with defaulted loans.

The policy can also be sold to others who are going to incur extra costs and losses when a severe El Niño is highly likely to create extreme flooding in the department of Piura. In due time, we hope that this will include businesses in the agricultural value chain. Producer organizations (i.e., value-chains) are offering credit to their members (e.g., COOPAC NORANDINO is the credit institution for CEPICAFÉ). These organizations should also be potential clients for the EBIII. As one clear indicator that this contract may be of value to those in the agricultural value chain, fertilizer sales were down 27 percent in 1998, as many farmers were unable to plant crops due to the rainfall, flooding, and other problems brought on by El Niño during the major growing season. This form of insurance could also be sold to those in the transportation industry, to those in government that must respond quickly to the catastrophic flooding, to government agencies that must replace destroyed infrastructure, and on a limited basis, to smallholder households that are clearly exposed to this risk (e.g., those who are farming in the flood prone regions and those who know their markets will be disrupted when infrastructure breaks down due to extreme flooding).

Classifying the Insurance and Developing the Contractual Details

There are a number of reasons why this insurance is being classified as business interruption insurance. First, the clear advantage of index insurance is that the index (in this case, the ENSO 1.2 index) serves as a proxy for loss for those who can clearly demonstrate an insurable interest. Our research and the research of a number of others demonstrate that the ENSO 1.2 measurements from ENSO 1.2 are a clear signal for extreme flooding in Piura. Furthermore, by making it clear that this is a form of business interruption insurance, regulators will be more comfortable with the use of ENSO 1.2 as the proxy indicator for losses. Regulators know how difficult it is to perform a loss estimate for business interruption insurance. This generally requires using accountants and records of business before and after the insured event. What we have learned is that regulators agree that these procedures will be difficult and would be likely to provide different answers when using different procedures. Thus, it can be agreed that using a pre-determined event that can be used as a proxy for loss is just as good or, in many cases, potentially better than procedures that are generally used to estimate losses for a business interruption insurance policy. An ENSO 1.2 index can serve as an excellent proxy for El Niño losses.

There are important details of this special form of insurance that will likely be written into the insurance contract. Many of those details are developed below. The insured and the insurer must agree to the following:

- ENSO 1.2 values from the ENSO 1.2 index are a good proxy for catastrophic flooding from El Niño;
- ENSO 1.2 measurements can be used to create an ENSO Index that is a reasonable proxy for cost incurred and losses suffered due to the catastrophic flooding;
- The insured does not have to prove losses;
- The maximum exposure is the sum insured in the contract;
- Indemnities will only be paid when the ENSO Index exceeds the threshold level indicated in the contract ;
- If the insured suffers loss from flooding that occurs when the ENSO 1.2 values from the ENSO Index are below the threshold value, these losses are not covered by the insurance policy;
- The insurer is only responsible for the losses triggered by the ENSO Index, up to the maximum sum insured, according to the terms of the contract. The insured is responsible for any excess losses incurred.
- **ENSO 1.2.** The monthly average sea surface temperature (SST) in the ENSO Region 1.2 (0°-5°S, 90°W-80°W and 5°S-10°S, 90°W-80°W) as measured and reported by the the NOAA Climate Prediction Center at the following internet address or is successor: http://www.cpc.ncep.noaa.gov/data/indices/sstoi.indices
- **ENSO Index.** The ENSO 1.2 values for the months included in the "Policy Period" (in this case, the average of November and December, 2009) are used to develop the "ENSO Index". The value of the ENSO Index is obtained from the monthly ENSO 1.2 using a simple average of the data for the coverage period (i.e., [Nov ENSO 1.2 + Dec ENSO 1.2) / 2]);
- **Maximum sum insured.** The agreed level of maximum payout for the insurance;
- **Start trigger** and **exit trigger** are levels of the ENSO Index used in making the payment calculation;
- **Sales Closing Date:** April 30, 2009;
- The risk insured by this policy is an **extreme elevation in ENSO 1.2**;
- **Extreme ENSO 1.2** is recognized if, during the "Policy Period" the level of the ENSO Index exceeds the **start trigger** of 24.5 Degrees Celsius;[4]
- If the ENSO Index reaches or exceed the **exit trigger** of 27.0, the payment will equal the maximum sum insured;
- The insured must select a maximum sum insured;
- The insured must warrant that the maximum sum insured that they select is not going to exceed their best estimate of maximum potential losses in the most extreme ENSO 1.2 event; and

[4] A separate contract using a start trigger = 24.0 may also be used. This would be more expensive and would also make larger payments in the two extreme loss years.

- If the ENSO Index exceeds the start trigger (24.5 degrees Celsius) the calculation of payout will be made with the following formula:

Business Interruption Payment = min {MSI * [(ENSO Index –ST)/ (ET – ST)] or MSI}

MSI = Maximum Sum Insured

ST = Start trigger (ENSO Index Temperature)

ET = Exit trigger (ENSO Index Temperature)

To illustrate how this contract would have paid in the two worst years, we can use the actual data. For simplicity we will assume that the MSI = USD 1 million. The average November–December ENSO 1.2 temperature was 26.28 in 1997 and 25.36 in 1983. The next nearest number since 1979 was in 2006 at 23.07. There was no flooding in 2006. Some recent research by climate experts demonstrate that values of ENSO 1.2 prior to 1979 are likely lower than they would be given the existing systems for estimating ENSO 1.2. Thus, these data are not used.

1997 payment = (26.38-24.5)/(27-24.5) = 71 percent payout rate or $710,000

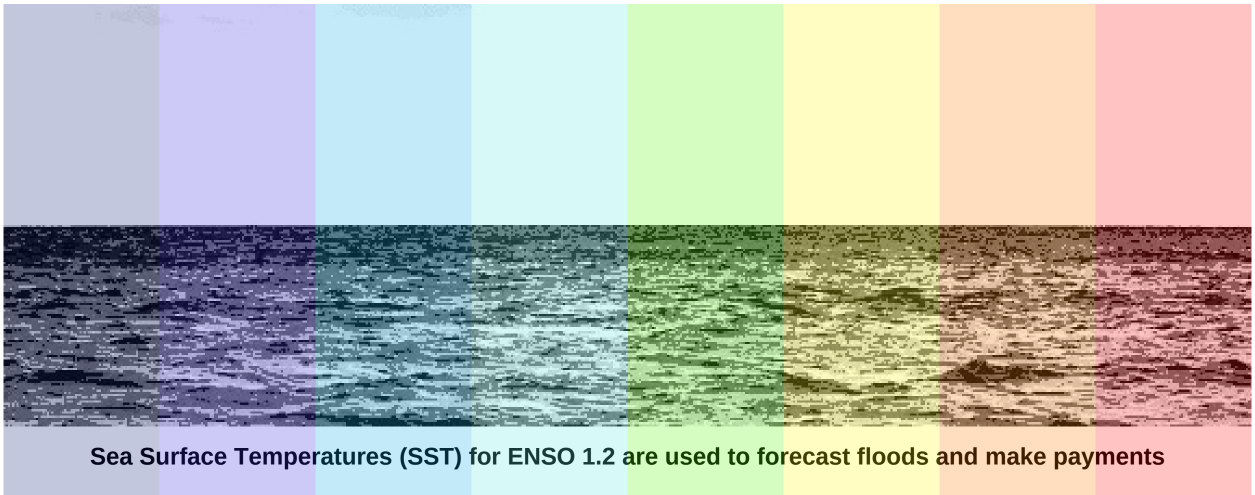
1983 payment = (25.36-24.5)/(27-24.5) = 34 percent payout rate or $340,000

La Positiva has obtained indicative pricing from a major reinsurer for this contract and another with a start trigger of 24. The contract with a start trigger of 24 would have paid 76 percent in 1997 and 45 percent in 1983. Everyone must understand that this form of catastrophic insurance involves special pricing to estimate the extreme conditions that can occur and to reflect the cost of having ready access to large sums of capital to make payments. Additionally, La Positiva will also need to add an administrative load to the price of the insurance to recover some of their costs. Finally, Peru has a 22 percent premium tax on insurance that must be added to this insurance contract. Nonetheless, even with these considerations, we believe that the pricing will be in an acceptable range.

While it is the natural tendency to ask "how much will it cost?" the question is premature until a serious assessment is made regarding "what is the value?" of the contract. What should be clear from the details above is that this contract will pay significantly in extreme flooding years. Even more fundamentally, the contract will pay *before* the catastrophic flooding begins. This should increase the value of the contract considerably. To our knowledge this may be the first contract of its kind to be designed to pay *before* the catastrophic event occurs

Table 1 illustrates the timing of the insurance contract. Consider the timing of EBIII sold to protect against El Niño in the spring of 2010. Because of signals regarding a potential El Niño, the sales closing date for EBIII must be set well in advance — insurance for the 2010 season should be sold by April 30, 2009. If the upcoming year were a year in which a severe El Niño event occurred, early indications would appear between May and October. By November, signals would be clear, and payouts could be issued in early January 2010. If an El Niño occurred, flooding would occur from February to April 2010. It is important to note that this example is intended to illustrate the EBIII in a year where payouts occurred and not intended to communicate anything about the likelihood of an El Niño in 2010 — it is still too early to determine whether or not an El Niño will occur in 2010.

Table 1 Timetable for the ENSO Business Interruption Index Insurance (EBIII)



The Timing of the Contract

Year 1			Year 2	
February –April	**May–October**	**Nov–Dec**	**Early January**	**February–April**
Marketing period with a sales closing date of April 30	The EBIII is in force for possible upcoming severe event	SST data from ENSO 1.2 is used to calculate payments	Payments can be made ***before*** flooding begins in February	Catastrophic flooding in the Piura region

Source: Authors

Using This Insurance to Increase Access to and Use of Loans

Previous research in Peru identified El Niño as one major factor that had led MFIs to restrict agricultural lending. Lending to the agricultural sector has not kept pace with the growth of financial services to other sectors. There are three types of MFIs that are involved with agricultural lending including the cajas municipales (CMACs) — municipal savings and credit associations; the cajas rurales (CRACs) — rural savings and credit associations; and the EDPYMEs (regulated NGOs for small and microenterprise development). These three types of MFIs have all experienced rapid expansion of their lending portfolios, growing from a combined total of USD 155 million in 1998 to USD 548 million in 2003. That represents a 350 percent increase in lending, almost all of which went to commercial or urban sectors. During the same period, agricultural lending remained stagnant with virtually no change in volume. In 1998, agricultural lending represented nearly 30 percent of the total lending portfolio of the CMACs, CRACs, and EDPYMES. In 2003, agricultural lending accounted for less than 10 percent of total lending. At the extreme, CMAC Piura has nearly stopped lending to agriculture altogether. However, in a recent meeting with them, they indicated a clear desire to increase agricultural lending.

As one might expect, the government of Peru must also respond to El Niño losses. The responses to the previous El Niño events were not favorable to lenders or to creating a proper environment for sustainable lending to agricultural sector. Instilling the right incentives is important for fostering market development and sustaining the market. The government allowed many farmers to simply write-off their loans after the 1997–98 El Niño. Lenders paid for much of the losses associated with this policy. Government programs to write-off loans create a precedent for government bail outs and erode the responsibility that borrowers have to repay their loans and that lenders have to recover them. Government interventions in the market through subsidies and bail outs might appear to be a helpful solution in times of disaster, but can crowd out the market. Thus, in part, it is likely that it was a combination of problems in loan repayment and government response that caused a reversal in agricultural lending trends after the last El Niño.

In assessing the potential value of this insurance, lenders must recognize that the cost of capital will increase dramatically when everyone knows that the catastrophic event is coming. Those supplying credit to the lenders in Piura will ration that credit as they know there is an increased risk of defaults. Furthermore, individual savings are likely to be withdrawn during a catastrophic event. Finally, as time passes the portfolio will suffer defaults and these will be quite costly on several levels. The cajas must provide provisions relatively quickly as loans become non-performing. Ultimately, the long period that one might expect before the loans are repaid will also involve significant cost. Having ready cash before the catastrophic event emerges could be highly valuable. There are some ways to provide clear indications of the potential value. One method is to provide an estimate of the risk loading on interest rates that is likely occurring because of these extreme El Niño events. We develop a basic method to make these estimates below.

Current Interest Rates and Risk Loads

Market interest rates are impacted by default risk. Ray (1998, pp. 544–545) provides a simple model of how default risk is loaded into interest rates. Assume that a lender's expected profit π is calculated as

(1) $$\pi = p(1+i)L - (1+r)L$$

where p is an exogenous probability of non-default ($1 - p$ is the probability of default) that is constant across all loans, i is an interest rate charged to borrowers, r is the lender's opportunity cost of funds used for loans, and L is the amount of funds loaned. In a perfectly competitive market, profits would equal zero in equilibrium, thus

(2) $$i = \frac{1+r}{p} - 1$$

A relatively simple example demonstrates how sensitive market interest rates are to default rates. Assume that the opportunity cost of funds r is 10%. If the probability of default is zero (p = 1.00), the market interest rate is also 10%. If the probability of default is 0.10 (p = 0.90), the market interest rate would more than double to 22%.

Exposure to spatially correlated risks (e.g., drought) further limits the availability of both financial and insurance services in low-income countries (Binswanger and Rosenzweig, 1986; Braverman and Guasch, 1986; Hoff and Stiglitz, 1990; Rosenzweig, 1988). When the losses experienced by borrowers are highly correlated, loan defaults are also likely to be highly correlated. Lending institutions attempt to reduce aggregate risk exposure by pooling loans. However, if the loans that make up the portfolio are susceptible to correlated shocks, the lender will be vulnerable to catastrophic losses. Unless this exposure to correlated shocks can be transferred out of the portfolio, a prudent lender will limit the amount of loans provided in a given area. The same logic holds for insurers. In this way, correlated risk exposure further contributes to the limited availability of formal financial and insurance services in rural areas of low-income countries. If these services are available, the costs are likely to be prohibitively high for most low-income households.

Consider an extension of the simple algebra presented in Equation (2). Assume that while the normal probability of default is 10% as presented above, every 1-in-10 years there is a correlated natural disaster that causes a 50% default rate. The average default rate is then 14%, which, given a 10% opportunity cost of funds, implies a market interest rate of 28%. However, a risk-averse lender will likely also add an additional interest rate load to account for the extreme default risk — in the same manner that a reinsurer loads reinsurance premium rates for the risk of extreme correlated loss events. In the case of reinsurance, it is not uncommon to see premium rate loads calculated by doubling the expected magnitude of loss for the extreme event. Applying this "rule of thumb" to this example, the lender would charge an interest rate that reflects a 100% default rate when the correlated natural disaster occurs. This generates an average default rate of 19%, which translates into a loaded interest rate of 36%. More likely, a small rural lender that lacks a geographically diverse portfolio would simply choose not to offer loans under these conditions. Finally, note that these numerical examples are based on the unrealistic assumption of a perfectly competitive loan market. To the extent that loan markets are less than perfectly competitive, this would cause market interest rates to be even higher.

MFI Lending in Peru

Table 2 provides some recent data for agricultural lending for the CMACs Piura and Sullana. For small loans offered by CMAC Sullana, the annual interest rate is over 58 percent. Two numbers can serve as the foundation for determining the interest rate charged to farmers in Piura: 1) a cost of money at about 8 percentage points; and 2) an administrative cost of delivery to small farmers of about 16 to 18 percentage points. To provide a conservative estimate for the base interest rates that should be charged given only the cost of money and the administrative cost, consider that these 2 values would equal 10 and 20. Thus, the *base interest rate* would be 30 percent per year. Given that actual lending costs are at least 10 to 15 percentage points higher than this, these extra costs may be attributed to risks. Another point of reference for the default risk: the MFIs in the region have a reserve provision for defaults of about 8 percent.

Table 2 Interest Rates for Agricultural Lending for the CMACs Piura and Sullana

CMAC Piura (as of February, 2009)		
Range	Monthly Interest Rate	Annual Interest Rate*
In Soles (S/.)	%	
Up to 3,000	3.9	57.4
3,001–5,000	3.6	52.9
5,001–10,000	3.6	52.0
10,001–15,000	3.5	51.1
15,001–25,000	3.5	50.2
25,001–30,000	3.4	49.4
30,000+	3.2	45.1
Simple Average	3.5	51.2

CMAC Sullana (as of February, 2009; effective from 2005)		
Range	Monthly Interest Rate	Annual Interest Rate*
In Soles	%	
Up to 2999	3.9	58.3
3,000–4,999	3.8	56.5
5,000–7,999	3.6	52.9
8,000–9,999	3.5	51.1
10,000–14,999	3.3	47.6
15,000–19,999	3.1	44.3
20,000–24,999	3.0	42.6
25,000–29,999	2.8	39.3
30,000+	2.7	37.7
Simple Average	3.3	47.8

Source: CMAC Piura website, http://www.cmacpiura.com.pe/prod/credagr.jsp; CMAC Sullana website, http://www.cmac-sullana.com.pe/010cmacnumpublic/ta.xls

* Based on 360 days

Portfolio-at-risk values increased to 18 percent in the 1997–98 El Niño year. If one assumes that these risks are 1 in 15, we can return to the math presented earlier and develop an estimate for the loading that is needed for a default risk. The load should be a minimum of about 6 percentage points. With a base of 30 percent, interest rates would need to be a minimum of 36 percent.

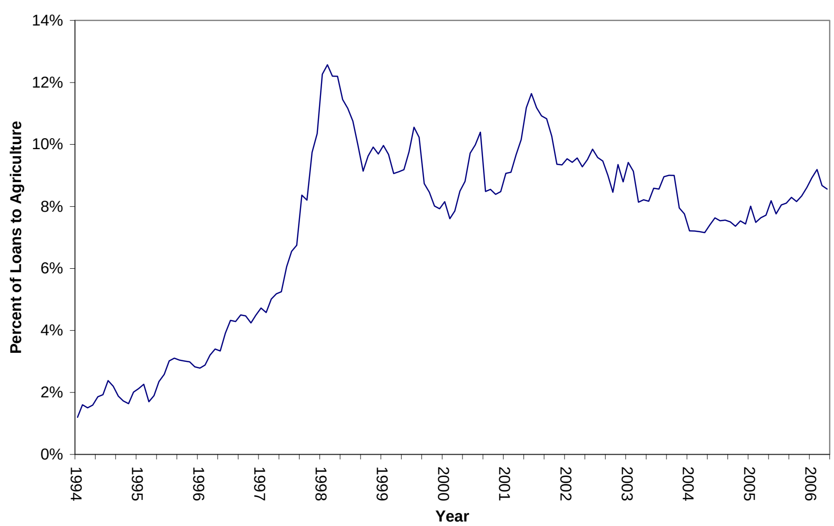
Using the EBIII to Support Agricultural Lending

The MFIs in Piura have expressed an interest in expanding their lending to the agricultural sector. Growth for lending in Piura has increased exponentially since MFIs have started working in that region. In 1994, total lending by MFIs in Piura was roughly USD 2.8 million. By 2006, the lending exceeded USD 270 million. While CMAC Piura is the largest lender in the region, CMAC Sullana is the largest lender for agriculture in the region, representing nearly 20 percent of their portfolio. After the 1998 El Niño, CMAC Piura dropped all farmers who defaulted on their loans. A large number of farmers defaulted because of the disaster. However, a large number also defaulted because the government allowed farmers to forgo paying their debt as a social policy. Of course, not all farmers had cash flow problems because of El Niño. Many simply took advantage of the government policy. The RFA — Rescate Financiero Agrario (Financial Rescue for Agriculture) — is highly controversial as it allows for special refinancing at levels that do not reflect the true cost. This policy came into effect in October, 2000.

Patterns of Lending in Piura

The longer pattern of agricultural lending for all MFIs in Piura appears in Figure 2. One can see that the percent of agricultural lending was increasing rapidly until the El Niño of 1997–98. Since that event, the overall percentage of lending has stabilized at about 8 percent of the portfolio.

Figure 2 Historic Pattern of Agricultural Lending in Piura, 1994–2006

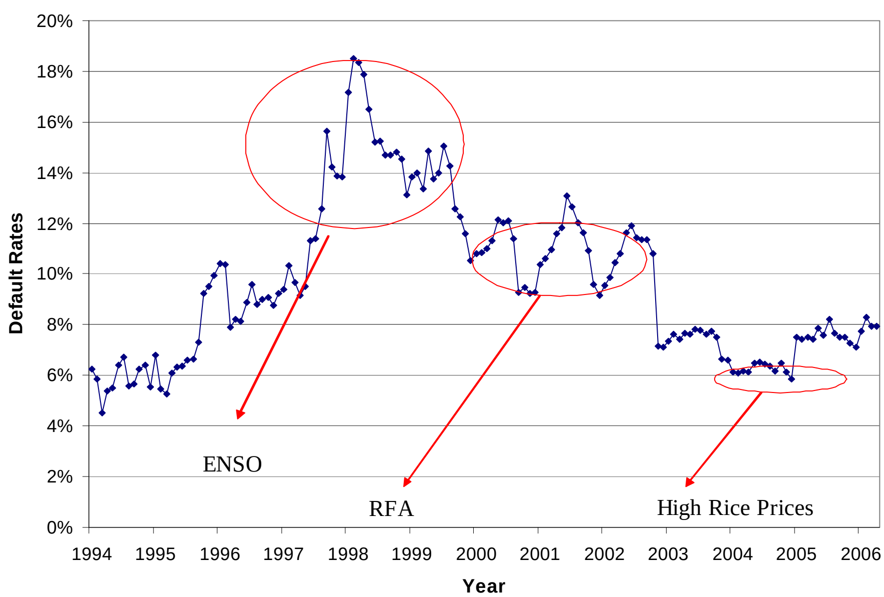


Source: Authors

Carolina Trivelli has been conducting research in Piura for a number of years and following a panel of farm households since 1997. Ms. Trivelli classifies a 2004 panel of 481 respondents in 4 groups: Group 1) those who use formal and informal credit; Group 2) those who could get credit but do not; Group 3) those who have asked for credit but have been rejected; and Group 4) those who have not asked for credit and do not have access to credit. Only 28 percent of the sample use formal credit. Another 47 percent could get credit in the formal sector but chose not to (Group 2). They give three reasons for not borrowing in the formal sector: 1) interest costs are too high; 2) transaction costs are too high; and 3) fear that they will lose their collateral. Some 7 percent of the sample have requested formal credit and have been denied: over 60 percent of this Group 3 gains access to loans in the informal sector. The remaining 18 percent of the sample have no access to formal credit. Even within Group 1 (those who use credit), some 30 percent of their loans come from the informal sector. As one might expect, those who use credit also invest more per hectare than the others (some USD 930 in Group 1 versus USD 600 in Group 2). Some studies suggest that if lending were increased for farm households in Piura they could increase their efficiency by as much as 50 percent. Obviously there are high returns to borrowing in the region. This must be the case, given the high cost of lending for agriculture in the region and the fact that there are farmers who are borrowing at the present costs.

Of more significance, the pattern of portfolio-at-risk after the 1997–98 El Niño demonstrates a lag effect that lasts for about five years. Figure 3 clearly shows that the portfolio-at-risk exceeded 18 percent for all loans in Piura at the height of the 1997–98 El Niño. It is not until the end of 2002 until these rates return to the levels in the 8 percent range. There were other factors that can account for some of this long lag. For example, the government allowed farmers to default on their loans a few years after the El Niño event. However, even this policy decision can be linked to El Niño.

Figure 3 Historic Pattern of Default Rates on All Loans in Piura, 1994–2006

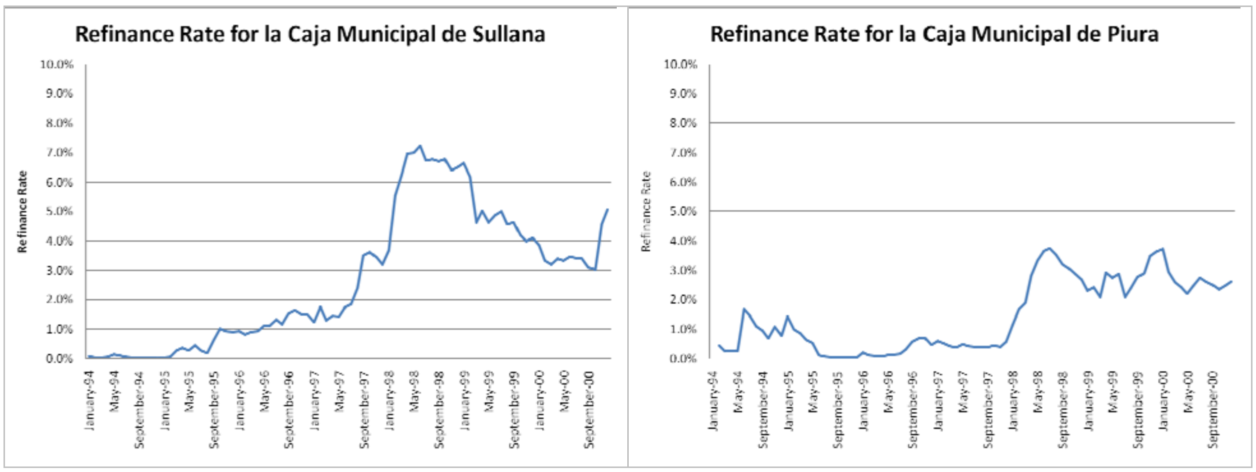


Source: Authors in collaboration with Carolina Trivelli

Effective Use of Risk Transfer to Reduce Peak Portfolio-at-Risk Values

Having a significant share of the borrowers who find it impossible to pay back their loans compounds the predicament into a longer-term problem. As individuals have trouble in repaying their loans, the MFI attempts to give them another chance by refinancing. If those individuals do not have adequate cash flows, their loans simply compound into larger debt. Thus, the lag time for having defaults is to be expected. The greater the peak in the portfolio-at-risk after a major shock such as El Niño, the longer is the lag time. Thus, if a risk transfer could be organized to reduce the peak, the recovery time would also be shortened. Consider the specific annual numbers that accompany Figure 3. Figure also presents the refinancing rates that accompanied the 1997/98 El Niño. Table 2 presents these numbers and a hypothetical risk transfer that would reduce the peak. The numbers in Table 3 are of course high estimates since one needs to discount for future savings and the MFI may still be able to collect something from those that fall into the portfolio-at-risk category. Nonetheless, Table 3 gives some perspective of what the aggregate savings could be if the 1998 average portfolio-at-risk values could have been reduced by 4 percentage points. The sum of the savings in Table 3 is about 18 percentage points.

Figure 4 Refinance Rates for Cajas Sullana and Piura



Source: Authors using data from the SBS website.

Table 3 Example of Potential Savings with a Risk Transfer that Would Reduce the Peak Portfolio-at-Risk Values in 1998

	Annual Portfolio-at-Risk Values	New Portfolio-at-Risk Values	Savings Due to Reduction in Portfolio-at-Risk
Year		%	
1998	16	12	4
1999	13	9	4
2000	11	8	3
2001	11	7	4
2002	10	7	3
2003	7	7	0

Source: Authors

The major question is how a MFI would actually use the EBIII to transfer risk and lower the peak of the percent of borrowers who have fallen into the portfolio-at-risk category. This question must also be positioned with a larger understanding of what the MFIs would do when an El Niño is coming. For agriculture, much of the lending for the major crop season is done early in the calendar year. At that time, the El Niño is evident. About 70 percent of the agricultural lending in Piura goes to rice production. Nearly 50 percent of those production loans occur in the sowing period of January. Interviews conducted with the CMAC Sullana reveal that they generally provide an open line of credit to the farmers that can be drawn on month by month. This allocation is made at the beginning of the year to provide adequate credit to get through both cropping seasons (the two cropping seasons for rice are January to June and July to December). They do not provide production loans to farmers who farm along the flood-prone areas. These farm households are offered consumption loans subject to review of the credit worthiness of the farmer. These consumption loans must be paid back in a special program or they can be used to count against future agricultural credit loans. Cutting back on agricultural lending in the future is not desirable. For those farmers who obtain a production loan and have a crop failure, CMAC Sullana will refinance the credit and give more credit based on an evaluation that may allow the farmer to change the crops in their production plan to crops that grow in a shorter season (e.g., beans). The additional liquidity provided by the indemnity payments for the EBIII could facilitate this type of activity even more. Such refinancing can be expensive for the farmer. Future insurance products that can be purchased by the farmer can further aid in reducing the peak on the defaults.

Summary and Highlights of Major Ideas

Among the most significant aspects of this new form of insurance is that it will pay for losses *before* the actual catastrophe occurs, which can be highly effective as a form of business interruption insurance. As everyone will know that the extreme flooding event is imminent, lenders will encounter difficulties obtaining the needed capital. Other serious liquidity constraints are likely to make the cost of capital during a catastrophic event very high indeed. Over time, the indemnity payments from the EBIII contract should allow the lenders to charge lower interest rates.

This contract will pay based on an ENSO 1.2 index of SST during the months of November and December. The payments should be made in early January, before severe rainfall and flooding occurs (typically beginning in January ending by April). For example, using the ENSO 1.2 numbers from November and December, 2010, payments would be made early in January, 2011 before losses are incurred from rain and flooding. Given that these events can be forecasted as early as May of the year before (May, 2009), the insurance will require a sales closing data of April 30, 2009. The events that are being insured are a 1-in-15-year event. We anticipate that the MFIs will continue to ration credit when there is a strong signal (the 1-in-15-year event). They should not make production loans to farmers whose fields lie in areas that are highly vulnerable to El Niño losses. However, given the indemnity payment they may be in a stronger position to offer consumption loans to these farmers and later to provide production loans to plant alternative crops after the flooding has dissipated.

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CONCEPT NOTE PREPARED FOR SUPERINTENDENCIA DE BANCA, SEGUROS Y AFP, REPÚBLICA DEL PERÚ

MICROINSURANCE FOR HOUSEHOLDS SUFFERING FROM EXTREME FLOODING BROUGHT ON BY EL NIÑO

May 2008[1]

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[1] This note was prepared by Jerry Skees, Anne Murphy, and Benjamin Collier of GlobalAgRisk, Inc. Richard Carpenter, an affiliate of GlobalAgRisk, Inc. and our legal and regulatory advisor with specific expertise in this work, has also contributed to this note. In preparing this note, GlobalAgRisk is acting in an advisory capacity only. As such, GlobalAgRisk cannot provide warranties or guarantees that the recommendations will anticipate all potential shortcomings or problems that may arise from a full implementation of these recommendations. Furthermore, any third party that uses this information must acknowledge that it is copyrighted @ by GlobalAgRisk, Inc.

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Smallholder Livelihoods — Microinsurance for Catastrophic Weather Events

A catastrophic ENSO microinsurance would be sold to smallholders as a form of business interruption insurance for the wide range of livelihood activities that are likely to be disrupted when a major ENSO creates extreme flooding in the northern regions of Peru. This would fit into Peru's new leadership role in facilitating microinsurance products for smallholders in Peru that are basic and involve low transaction costs.

Background on ENSO Insurance in Peru

In 2005 and 2006, GlobalAgRisk, Inc. led a team of consultants in a USAID project designed to develop weather insurance products in Peru. Research emerging from that project clearly demonstrated that strong anomalies in the sea surface temperatures off the coast of Peru create extreme flooding in northern Peru. This work was carefully developed in collaboration with climate experts from Columbia University and The Ohio State University. The team found that El Niño flooding in Piura could be predicted using ENSO 1+2, a NOAA measurement of ENSO. We developed prototype ENSO insurance products that would make indemnity payments only when ENSO 1+2 are at extreme values (when the oscillation exceeds +2.0).

Beyond the damage to crops and other livelihood strategies, the extreme flooding events of 1982–83 and 1997–98 destroyed or severely damaged public infrastructure such as roads, bridges, water reservoirs, and irrigation systems. The significant disruptions of basic transportation created problems for many types of trade that support poor households. This, in turn, created cash flow and debt repayment problems for those financial institutions making loans to a wide range of small and medium enterprises in these regions.

GlobalAgRisk, Inc. worked extensively with the Superintendencia De Banca, Seguros y AFP to assure that ideas being presented would be properly positioned in the Peruvian regulatory environment. The interactions and feedback obtained from the SBS of Peru were very positive. By the fall of 2006, the SBS had approved ENSO Insurance as a form of insurance that could be sold in Peru. Importantly, GlobalAgRisk, Inc. also worked with local insurance providers and a global reinsurer to assure that such insurance would be offered in the Peruvian market. Since that work, La Positiva Seguros y Reaseguros of Peru and the global reinsurer, PartnerRe, have demonstrated a strong willingness to underwrite ENSO Insurance for a wide range of potential customers who are adversely affected when extreme ENSO events create flooding and major losses in various regions of Peru.

Creating Natural Disaster Livelihoods Microinsurance for Poor Households

In many countries, natural disasters are an impediment to rural development and adversely affect a whole range of livelihood strategies that can keep poor households from falling into a poverty trap. For example, a drought or flood may destroy a household's crops, but also households, including the landless poor, may lose the opportunity to earn money from harvesting someone else's crops, or may have jobs in the local economy affected by the drought or flood. Livestock and home gardens can also be devastated. Thus, even when households diversify by using their limited resources for crops, livestock, and labor earnings, all of these sources of income and sustenance can suffer at the same time due to an extreme disaster.

Not only do natural disasters limit the ability of households to manage risk through diversification, but natural disasters also overwhelm risk management and risk coping strategies within the community. For example, if households have informal insurance arrangements with neighbors or through local groups and a severe drought or flood occurs, all parties in the community are likely to suffer, and both formal and informal risk coping strategies within the community are likely to break down. In some countries, livestock is a form of "savings," but the "distress sale" of large numbers of livestock at the same time after a natural disaster can depress prices in local areas, making this strategy less effective for protecting households from income shocks.

Natural disasters also limit the availability of credit and insurance in local communities. Lending to rural households represents too high of a credit risk for banks that fear a disaster would result in the many affected households defaulting on their loans at the same time. Likewise, local insurers fear that a disaster would result in all their customers qualifying for indemnity payments and overwhelming their reserves. Thus, these lenders and insurers charge rates households cannot afford or ration their services. In sum, natural disasters have limited opportunities for growth in rural areas because mechanisms to manage catastrophic risks have been unavailable in these communities.

Weather index insurance is creating new opportunities to manage catastrophic risk for rural households. It insures against bad weather by making payments based on an index measurement of the weather event. For example, if drought were a concern, payouts could be based on rainfall levels at local weather stations. Compared to traditional forms of insurance (e.g., multiple peril crop insurance), weather index insurance can provide more affordable coverage and is largely free of the moral hazard and adverse selection problems that have plagued traditional insurance. Additionally, basing payments on an objective and transparent index seems to be increasing opportunities for obtaining global reinsurance, a necessity for local insurers attempting to manage catastrophic risk.

Weather index insurance is not without its limitations. First, weather index insurance experiences basis risk — the problem that a mismatch occurs between household losses and the measure of the weather event at the closest weather station. Basis risk should be lowest for catastrophic risks because when these events occur, they tend to affect the whole region in a similar way. Second, the other major constraint is that weather index insurance requires reliable weather data. The insurance contract is priced based on historical weather data — often, ideally on daily data for at least 30 years, which are often missing in lower income countries. Because payouts are based on current levels of the weather index, weather index insurance also requires weather stations to be maintained and kept secure on an ongoing basis. Despite these limitations, several countries (e.g., India, Mongolia, Mexico, and others) have thus far had positive experiences with index insurance programs.

Framing ENSO Microinsurance as Business Interruption Insurance for Poor Households

Recent advances in index insurance for weather risks are encouraging; however, our experiences have revealed that significant limitations remain for designing weather insurance, especially when targeting the rural poor (e.g., product design challenges and the associated regulatory concerns that may accompany different weather insurance products). There are three primary questions for a regulator who is reviewing index insurance: 1) Is the index insurance a suitable product for poor rural household? 2) Is the index a good proxy for loss? and 3) Can the insured party demonstrate an insurable interest? Our work has demonstrated that both questions can be addressed for most index insurance products.

Is the Index Insurance a Suitable Product for Poor Rural Household?

When major disasters affect so many sources of household income and other livelihood strategies and that same time, the working poor are many times the ones who suffer the most. Not only can these shocks disrupt the lives of the working poor, they can devastate the working poor so significantly that they are thrust into chronic poverty; never to recover. By framing this insurance as a form of 'business interruption' insurance that compensate for a wide range of disruptions to livelihoods, it is possible that the insurance can also be made more accessible to the working poor and landless households. The 'insurable risk' is based on the livelihood activities. Thus, the working poor need not demonstrate that they have planted hectares that they own or control as with traditional crop insurance or some of the weather index insurance products that are being developed.

Is the Index a Good Proxy for Loss?

Regarding the issue of the index being a good proxy for loss, a fundamental misunderstanding of what weather index insurance is, affects this issue and can lead to it being designed, marketed, and regulated ineffectively. Weather Index can mistakenly be sold as crop insurance giving the wrong impression that it covers more crop loss events than is the case. Weather index insurance can have many outlets for protecting income activities affected by bad weather, especially natural disasters; however, weather index insurance is not a suitable substitute for crop insurance. Weather index insurance can be a relatively poor proxy for crop yield losses, especially when trying to insure small to moderate yield declines.

Some product designers have tried to match weather index insurance products more closely with crop yields using complicated models with several weather variables, but this ignores the specific limitations affecting weather index insurance in lower income countries. First, their models assume that all farmers are using the same production methods and are farming the same type of soil. Such modeling work may not fit given the variety and complexity of rural agriculture in lower income countries. Second, these models rely on limited or unsecured weather and crop data with missing values. This data is less likely to estimate extreme crop losses accurately. Finally, like crop insurance, these index insurance products are designed to insure moderate declines in crop yields. All of these issues — differing soil and production methods, insufficient weather and crop data, and insuring moderate risks — increase basis risk for index insurance. These models over-fit the weather index insurance product to the available data, leading product designers to overestimate the effectiveness of their design as a proxy for household losses.

This over-fitting, in turn, may also lead to products being oversold — marketing weather index insurance in ways that ignore its limitations for protecting crop yields. For example, if sales agents market weather index insurance as crop insurance, households buying weather index insurance may believe that they will get compensated for any yield declines they experience, but if an uninsured event — a different weather event or a pest problem — results in losses, households will not receive a payment. When households believe they are protected from risks that they actually are not protected from, they can end up worse off than if they had not purchased the insurance product.

Can the Insured Party Demonstrate an Insurable Interest?

Regarding the third regulatory issue, which is that of insurable interest, it may be quite easy for regulators to also overlook the fact that weather insurance is not crop insurance — this may be particularly true if they have tied insurable interest requirements to specific crops and the size of landholdings. This is problematic because 1) it contributes to the misunderstanding that weather index insurance is crop insurance, and 2) it largely excludes the poorest segments of the working poor. Poor households are more likely to be landless laborers and to be engaged in a variety of livelihood activities to generate income. By limiting weather insurance to a single livelihood —

agriculture — and to a single crop, it ignores the actual livelihood strategies and needs of the poor. Thus, even though the poor are adversely affected by weather risk and are often vulnerable to falling into chronic poverty when natural disasters occur, they may be ineligible to purchase weather index insurance when it is regulated in this manner.

To significantly reduce the regulatory constraints that may preclude the use of weather insurance by smallholders or landless households, we propose framing weather insurance as a form of "business interruption" insurance for households against catastrophic risks. In this context, households could purchase weather insurance that paid a sum insured that would compensate them for income losses associated with all their livelihood activities if a disaster occurred. Households could estimate their income losses when, for example, a droughts occur and purchase a contract for this sum insured. Regulators could consider setting limits on the sum insured so that products were designed for poor households; however, specific metrics of household assets such as landholdings may be artificially limiting regarding the use and amount of coverage households interested in such a product might need.

CONCEPT NOTE PREPARED FOR SUPERINTENDENCIA DE BANCA, SEGUROS Y AFP, REPÚBLICA DEL PERÚ

Classifying ENSO Insurance as a Warranty-like Instrument to Reduce Provisioning Requirements and to Improve Access to Rural Loans

May 2008[1]

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Portfolio Risk, El Niño, and Agricultural Lending in Northern Peru

It has been demonstrated that ENSO Insurance can serve as a form of business interruption insurance for microfinance institutions lending to small households in Peru. ENSO Insurance can also compensate for default problems that may emerge as major flooding creates loan repayments problems. Thus, ENSO Insurance could be classified as a form of preferred guarantees enabling the SBS of Peru to allow microfinance institutions who purchase ENSO Insurance to move to Table 2 of the reserving requirements for lenders under SBS Resolution 808-2003.

The following is our translation of the language that goes with the reserving tables in SBS Resolution 808-2003:

> If commercial credits, micro enterprise credits, and credits for consumption have preferred guarantees that can be converted into cash quickly, the financial institution will constitute provisions according to Table 3. If guarantees are only preferred guarantees Table 2 must be followed. Financial institutions will constitute provisions for the amount of credit not covered with guarantees as outlined in Table 1.

We would like to make the case that ENSO Insurance may be consider preferred guarantees as it provides a ready source of cash when severe flooding creates loan repayment problems. Taking this action would increase the incentives for all lenders in a department like Piura to impose the same credit constraints for fear of El Niño driven flooding, and by the same token, it would strengthen the lending sector overall by giving them the needed incentives to purchase the ENSO Insurance.

Background on ENSO Insurance in Peru

In 2005 and 2006, GlobalAgRisk, Inc. led a team of consultants in a USAID project that was designed to develop weather insurance products in Peru. Research emerging from the project clearly demonstrated that strong anomalies in the sea surface temperatures off the coast of Peru create extreme flooding in northern Peru. This work was carefully developed in collaboration with climate experts from Columbia University and The Ohio State University. The team found that El Niño flooding in Piura could be predicted using ENSO 1+2, a NOAA measurement of ENSO. We developed prototype ENSO insurance products that would make indemnity payments only when ENSO 1+2 are at extreme values (when the oscillation exceeds +2.0).

Beyond the damage to crops and other livelihood strategies, the extreme flooding events of 1983 and 1998 destroyed or severely damaged public infrastructure such as roads, bridges, water reservoirs, and irrigation systems. The significant disruptions of basic transportation created problems for many types of trade that support small households. This, in turn, created cash flow and debt repayment problems for those financial institutions making loans to a wide range of small- and medium-size enterprises in these regions.

GlobalAgRisk, Inc. worked closely with the Superintendencia De Banca, Seguros y AFP to assure that ideas being presented would be properly positioned in the Peruvian regulatory environment. The discussions we had with the SBS regulatory staff contributed significantly to the development of our ideas and by the fall of 2006, the SBS had approved ENSO Insurance as a form of insurance that could be sold in Peru. Importantly, GlobalAgRisk, Inc. also worked with local insurance providers and a global reinsurer to assure that such insurance would be offered in the Peruvian market. Since that work, La Positiva Seguros y Reaseguros of Peru and the global reinsurer, PartnerRe, have demonstrated a strong willingness to underwrite ENSO Insurance for a wide range of potential customers who are adversely impact with extreme ENSO events create flooding and major losses in various regions of Peru.

Microfinance Lending in Northern Peru

The agricultural lending portfolios of cajas in the Piura region are highly vulnerable to default risk when the region is affected by major floods during the winter agricultural season. A large number of farmers defaulted on their loan repayments following the El Niño driven floods of 1983 and 1998, due to the agricultural losses they sustained. During the 1998 El Niño, loan defaults spiked from their 8 percent average to 18 percent. The cajas expect that future major floods would cause similar agricultural losses leading to significant loan defaults and are concerned that other sectors in the lending market would also be adversely impacted because of the devastation to the community infrastructure. Major floods therefore have the potential to cause significant economic loss to the cajas.

Since there are strong indications of El Niño by the time that agricultural loans are being made in early January, lenders simply do not loan to farmers in years when an El Niño is likely. This behavior was evidenced in 2006 when there were indications that El Niño could develop in late 2006 and early 2007. With this threat of El Niño in the second half of 2006, many lenders reduced their lending activity to safeguard against potential losses. However, a severe El Niño did not emerge. While this may appear to be a reasonable risk management strategy for a caja to adopt, as it protects the caja's loan portfolio, the restriction in the availability of credit in El Niño years, or in years when El Niño is expected, is inefficient for the cajas and causes obvious difficulties for borrowers. By reclassifying ENSO Insurance as a preferred guarantee, some of this damaging behavior by the lenders may cease.

From the perspective of the caja, rationing lending is inefficient, creating opportunity costs to the caja of foregone profits. Additionally, loan rationing does nothing to demonstrate a longer-term commitment to borrowers, who may then decide to seek credit from other sources, resulting in a permanent loss of business to the caja. Loan rationing is also inefficient for borrowers, such as farmers, who depend on credit to plant their crops. Farmers can face significant hardship when their income activities are affected by loan rationing.

The provisioning from Resolution SBS 808-2003, demonstrates how significant the provisioning requirements are for Table 1 versus Table 2. The requirements increase by twofold for loans that are between 31 and 60 days late for the lending institutions having no preferred guarantee.

Summary of Key Information from Resolution SBS 808-2003

Classification of Loans		Table 1	Table 2	Table 3
Regular	8 or fewer days late	1	1	1
Potential Problems	9 to 30 days late	5	2.5	1.25
Deficient	31 to 60 days late	25	12.5	6.25
Doubtful	61 to 120 days late	60	30	15
Lost	More than 120 days late	100	60	30

Such aggressive requirements place a significant cash flow burden on the lender precisely at the moment when they most need liquidity. This will be particularly true when a large percentage of the loans are in the deficient category due to an El Niño event. ENSO Insurance can ease the liquidity problem during these difficult times. This will make the provisioning less onerous for the lender during less severe periods and give them the incentives needed to protect the portfolio from El Niño driven loan performance problems.

ENSO Insurance for Business Interruption and Loan Defaults for Rural Lenders

ENSO Insurance has several benefits for cajas, some of which should be passed on to households through reduced interest rates and increased access to loans in El Niño years. Primarily, these benefits are centered on the business advantages of having a reduction in portfolio risk and a timely increase in capital due to indemnity payments.

To illustrate how a caja might use ENSO Insurance, assume that a caja has US$100 million in loans. When the 1998 El Niño occurred, default rates increased by 10 percentage points. Thus, the caja might expect to have an additional US$10 million of its portfolio that must be restructured due to loan repayment problems. The caja needs to evaluate how much of this might present serious repayment problems. Given the low probability of ever recovering loans that go into the lost classification, it is easy to assume that 80 percent of the additional bad credit of US$10 million — US$8 million — must be totally written off. Additionally, the cost of capital associated with restructuring loans must be considered. The 1998 El Niño was a 1 in 20 year event. Thus, the expected value on this write off could be equal to nearly US$½ million for each year — ½ of 1 percent of the total portfolio value.

Again, for simplicity, assume that the hypothetical caja above decides that they wish to purchase ENSO insurance for a sum of US$5 million to offset part of the US$8 million that they can expect to lose from the default problem. A high cost estimate for this type of insurance is 20 percent rate-on-line. At this price, the ENSO insurance would cost 1 percent of the total portfolio value (20 percent x US$5 million of liability equals US$1 million). If half of this cost were simply trading premium dollars for indemnity over time — the cost of the actual losses transferred to the insurer, the economic question is are the other risk management benefits were worth an additional ½ of 1 percent of the portfolio?

The answer to this question may largely depend on the cost of capital during the crisis. When a severe El Niño occurs, cajas often experience cash flow problems due to a combination of savings withdrawals, reduced loan repayments, and increased reserving requirements due to loan restructuring. As a result, the cost of capital is often increased in this situation. ENSO Insurance, which would provide capital during this crisis, could be very useful for cajas. For many cajas, the benefits of ENSO insurance are likely to exceed the costs; however, official regulatory recognition of the improved risk position of cajas with ENSO insurance could also facilitate interest in improved risk management among cajas.

Business Interruption and Capital Reserving Regulation

The proposed ENSO index-based insurance product (and other index-based weather risk transfer products) has the potential to be a valuable risk management tool for Peruvian cajas. Not only should it enable cajas to better price the provision of credit, but also by reducing the risk of economic loss, it may be possible that reserving requirements could also be reduced and credit ratings improved.

Providing regulation that recognizes the risk reduction of business interruption ENSO Insurance against El Niño for cajas seems consistent with current Peruvian banking regulations and could also increase incentives for cajas to purchase risk transfer. For example, the Regulation for the Evaluation and Classification of the Debtor and Provisioning (Resolution SBS No. 808-2003) provides that a caja's reserving requirements in respect to credit risk may be reduced when the caja has 1) security in respect to that credit risk; or 2) the benefit of an insurance policy covering the risk. This regulation could potentially be cited as the foundation for using business interruption insurance for El Niño toward capital reserving requirements and could even affect the credit risk rating of cajas.

The SBS has also expressed some willingness to review and possibly change the credit rating of rural finance institutions that purchase ENSO insurance. Improved credit ratings would have two direct benefits to the cajas of Peru: 1) the caja could expand their lending; 2) the caja could get better premiums for the country's depositor insurance program, which protects depositors up to US$20,000 if the regulated financial entity defaults. In turn, this should enable the contracting cajas to reduce interest rates charged to borrowers and, in the longer term, perhaps to develop pass-through products possibly in association with Peruvian insurers.

To the extent that the regulator responds directly to those rural finance institutions that purchase the ENSO insurance, this could increase the use of this type of risk transfer instrument, protecting solvency for the cajas.

Advised Caution Regarding ENSO Insurance and Note Summary

As a matter of caution regarding the role of ENSO Insurance, ENSO Insurance should not be viewed as the only choice, but rather as a good complement to several other strategies that may help ease the problems associated with extreme catastrophic risks and the obvious liquidity problems that follow for the lenders in northern Peru. Additionally, heavy rain did occur in Piura and parts of northern Peru in early 2007, but was not nearly as severe as the 1983 or the 1998 events. The 2007 event was not associated with El Niño illustrating, which illustrates that while ENSO Insurance would address the primary risk of defaults due to the most severe flooding, some risk of flood losses remain with ENSO Insurance. Other risk transfer products could potentially be developed to insure against the possibility of flood more completely.

In sum, despite these limitations, ENSO insurance could provide great potential benefits to cajas and the households they serve by:

1. Reducing the pure risk of the loan portfolio, which may result in reduced interest rates for borrowers;
2. Reducing the true cost of capital during a credit crunch when investors are withdrawing savings and when borrowers may wish to have a consumption loan;
3. Increasing access to ready capital to offset the real cost of the loan defaults/restructuring and added provisioning requirements during difficult times; and
4. Increasing economic returns associated with a potential increase in credit rating that allows the caja to make more loans.