GlobalAgRisk Projects in Vietnam, Peru, and Mongolia: Four Case Studies

Innovation in Catastrophic Weather Insurance to Improve the Livelihoods of Rural Households[1]

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Acknowledgements

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The four case studies highlight GlobalAgRisk work with specific applications of index insurance in three countries: Vietnam, Peru, and Mongolia. The cases are presented in order of our most current project to our earliest effort in Mongolia. The Mongolia case provides new ideas about how to develop index insurance in a country with limited experience in selling catastrophic insurance products. In particular, the risk financing structure offers a model that can be replicated in other lower income countries that may decide to develop weather index insurance products. Mongolia also illustrates the constraints that may be imposed by the regulatory framework to the development of bundled insurance products that may involve index insurance and credit and the associated problems of the delivery systems to be used. In Vietnam, we are advancing two products: 1) a flood product in the Mekong Delta and 2) a drought product in the Central Highlands. In both cases, the policies are designed to deal with consequential losses and increased costs associated with the catastrophic event. Our effort at developing ENSO Insurance in Peru provide numerous valuable lessons regarding developing index insurance for consequential losses and increased costs as well as learning how such policies can fit within the context of banking regulations.

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Acronyms and Abbreviations

AEC	*Agricultural Extension Center (Vietnam)*
Aimag stop loss	*Stop loss reinsurance offered by the GoM for aimag loss ratios above 125 percent of the RLP*
AMA	*Advanced Measurement Approach*
AOML	*Atlantic Oceanographic and Meteorological Laboratory (NOAA)*
BCBS	*Basel Committee on Banking Supervision* *Bank for International Settlements, Basel, Switzerland*
BIP	*Base Insurance Product* *Commercial insurance product paying for a layer of risk between 8 and 30 percent livestock mortality (Mongolia)*
BIP Reserve	*The GoM reinsurance fund that is financed by a portion of RLP paid by herders*
CAR	*Capital Adequacy Requirements*
DX-HT	*Dong Xuan-He Thu (Double-crop pattern for rice used in Vietnam)*
ENSO	*El Niño Southern Oscillation*
FRC	*Financial Regulatory Committee (Mongolia)*
GCC	*Government Catastrophe Cover* *Government financed coverage automatically included with purchase of BIP. Pays for layer of catastrophic risk for losses between 30 and 100 percent mortality; Payments are based on the same sum insured value as the herder purchases with the BIP (Mongolia)*
GDP	*Gross Domestic Product*
GoM	*Government of Mongolia*
GoV	*Government of Vietnam*
IBLI	*Index-based Livestock Insurance (Mongolia)*
IPF	*IBLI Participation Fee* *The payments required by insurance companies for the right to participate in IBLI program and receive favorable terms on GoM reinsurance; The IPF is the insurance companies' capital at risk and a fully secure form of reserves for their exposure*
IRB	*Internal Ratings-based (Approach)*
LIIP	*Livestock Insurance Indemnity Pool*

LIIP stop loss	*Stop loss for the LIIP account based on loss ratio after the GoM reinsurance is paid for an aimag stop loss*
MFI	*Microfinance institution*
mm	*Millimeter(s)*
MNT	*Mongolian Tugrik* *USD 1 = MNT 1,420 (March 8, 2010)*
MSI	*Maximum Sum Insured*
NOAA	*United States National Oceanic and Atmospheric Administration*
NPV	*Net Present Value*
NSO	*National Statistical Office (Mongolia)*
PHOD	*Physical Oceanography Division (NOAA)*
PIU	*Project Implementation Unit*
RAM	*Risk Assessment Model* *The IBLI pilot program risk assessment model that uses historic mortality rates and current value at risk by species and soum to model the risk profile of the BIP*
RLP	*Risk loaded Premium* *The portion of the BIP premium paid by herders that is used for financing indemnity payments and BIP reinsurance—it does not include the administrative portion of the BIP premium*
SIWRP	*Southern Institute for Water Resources Planning (Vietnam)*
SST	*Sea Surface Temperature*
SUC	*Standard Unit of Cover*
USD	*U.S. Dollar*
VBARD	*Vietnam Bank for Agriculture and Rural Development*
VND	*Vietnamese Dong* *USD 1 = VND 18,765 (March 8, 2010)*
World Bank Contingent Credit	*The GoM access to contingent credit to fund extreme losses beyond the capacity of the BIP Reserve for the BIP and for all losses from the GCC*

Case Study 1
Business Interruption Index Insurance: Consequential Losses from Flood in the Mekong Delta, Vietnam

Jason Hartell and Jerry Skees

GlobalAgRisk began working in Vietnam in 2005 on a project funded by the Asian Development Bank through a subcontract with World Perspectives International. The project was in response to a request from the government of Vietnam (GoV) for an investigation into potential index-based agricultural insurance products. Subsequent financial support was provided by the Ford Foundation. The World Bank Commodity Risk Management Group (now the Agricultural Risk Management Team) participated in the effort through several joint missions to Vietnam, contributions to a feasibility study, and commissioning a remote sensing analysis of flooding in the region eventually targeted for a pilot test of the proposed insurance product. Officials from the Department of Insurance and Ministry of Finance were also very actively involved throughout the product development process.

Initial discussions with GoV officials and other stakeholders suggested that the project should focus on risks associated with rice production. Rice is one of Vietnam's most important crops both for domestic consumption and export. Stakeholders also indicated that flooding was one of the most critical risks facing Vietnamese rice producers.

Further discussions focused the project on Dong Thap Province, located approximately 171 km west of Ho Chi Minh City in southeastern Vietnam along the Cambodian border. Agriculture is the dominant economic activity in Dong Thap and rice is the most important crop. It is common for farm households in the province to obtain up to 90 percent of their annual income from rice production.

While the initial request from the GoV was for an investigation of index-based agricultural insurance, prefeasibility studies revealed that existing legal constraints along with the lending practices of the primary agricultural lender, the Vietnam Bank for Agriculture and Rural Development (VBARD), effectively provided some degree of "insurance-like" protection for agricultural borrowers. Local VBARD offices, however, were highly exposed to consequential losses associated with loan defaults and restructuring that often occur following major natural disasters — such as flooding that affects rice production. Thus, with the approval of the GoV, the focus of the project shifted to providing flood-based insurance to VBARD. The Vietnamese insurance partner on the project is the Bao Minh Insurance Corporation.

1.1 Flood Risk and Rice Production in Dong Thap Province

Dong Thap Province is located in the seasonally flooded alluvial plains on the north bank of the Mekong River. Water levels begin rising in Dong Thap around mid-June and flooding lasts until the end of January. During this time, large areas of the province are flooded to depths of at least 2 meters. The highest flood levels occur between late September and late October.

Farmers in Dong Thap have adapted their rice production activities to accommodate and take advantage of the natural flood cycle. While flooding is a normal annual occurrence, early flooding causes major problems.

Rice cropping patterns in Dong Thap vary from single-crop to triple-crop but the most common is a double-crop pattern known as Dong Xuan-He Thu (DX-HT). The first rice crop, the DX or winter/spring crop, is usually planted in late January and harvested in March. The second rice crop, the HT or summer/autumn crop, is sown in April or May and ready for harvest in June or July. Under normal circumstances, farmers are able to harvest their second rice crop before the flooding inundates fields. Problems occur when the flooding occurs earlier than expected and farmers still have unharvested rice in the fields. The result is yield loss, quality loss, higher harvest and post-harvest handling costs, and numerous other consequential losses. Among the most significant of these consequential losses is the diversion of household labor from productive activities to loss mitigation efforts such as moving animals or putting sand bags on dykes. The reduced revenue and higher costs due to early flooding contribute to a household's difficulty repaying production loans. Many farmers still recall the last major early flood in 2000, which, according to historical data, was a 1-in-10-year event. Losses incurred from this early flood were so extensive that some farmers had to sell land to repay their loans.

1.2 Impact of Flooding on Agricultural Lenders

The VBARD is a state bank and main agricultural lender in Vietnam. In Dong Thap Province, the VBARD has approximately 70 percent of the market for agricultural lending. VBARD interest rates generally do not vary to reflect the borrower's risk exposure. In the past, when, as a result of major natural disasters, borrowers were unable to repay their loans, the VBARD forgave the debts (though this might cause the borrower to have trouble obtaining credit again in the future) and, if necessary, the GoV would then recapitalize VBARD.

Vietnam joined the World Trade Organization in January, 2007. This has created pressure for financial institutions to adopt international standards and regulations. As a result, the VBARD is in the process of transitioning to a more market-based orientation. Loan forgiveness has been replaced by loan restructuring. If clients cannot repay loans even after they have been rescheduled, the law allows the VBARD to seize and sell household assets to recover the principal and any unpaid interest. However, in practice, this rarely occurs due to complex legal procedures.

Each local VBARD office holds an aggregated portfolio of agricultural loans from the local area. In Dong Thap, a large proportion of those loans are simultaneously at risk of default or restructuring due to losses caused by early flooding. Due to legal constraints and VBARD liberal restructuring policy, the VBARD effectively functions as a type of *de facto* insurer of agricultural flood losses in the region.

1.3 Designing a Flood Index Insurance Product

Early flooding in Dong Thap Province is due to excess rainfall upstream; not excess rainfall in the province. Thus, there is generally some lead-time between when excess rainfall occurs in the upper Mekong River Basin and when flooding occurs in Dong Thap.

The Tan Chau Gauging Station, located near the border between Vietnam and Cambodia, measures Mekong River water levels. Analysis by the Southern Institute for Water Resources Planning (SIWRP) in Ho Chi Minh City indicates that the water level at the Tan Chau Gauging Station is a good proxy for downstream flooding in Dong Thap. There are few manmade obstructions on the Mekong River in Cambodia upstream of the Tan Chau Gauging Station.

There are several dams on the Mekong River in China but only about 10 percent of the water that flows into Vietnam comes from China. Most of the water originates from natural flows and rainfall in Laos and Cambodia. After discussions with experts, any upstream influences or developments at this time are concluded to be unlikely to change the probability of extreme flooding for the critical time period proposed for an index insurance contract.

1.3.1 Underlying Index and Indemnity Function

After consultations with various stakeholders, the underlying index for a flood insurance product was constructed as the maximum three-day moving average of daily water levels measured at the Tan Chau Gauging Station during the June 20–July 15 period when the policy was in force. This period corresponds to the most intense activity for the second crop rice harvest in Dong Thap. The project recommended a May 15 sales closing date since, based on historical data, it did not appear that significant information about June 20–July 15 flood levels was available prior to May 15.

The insurance product was designed with a linear indemnity function such that

$$Indemnity = \min\left[\left(PR \times \left(MRL - T\right)\right), MSI\right]$$

where *MRL* is the maximum river level during the policy period measured as described above, *T* is the threshold above which the insurance starts paying indemnities, *MSI* is the maximum sum insured, and *PR* is the payment rate per centimeter of flooding above the threshold. *PR* is calculated as

$$PR = MSI \times \frac{1}{UL - T}$$

where *UL* is the upper limit of flooding covered by the contract (no additional payment is made for flood levels above *UL*). Some defined upper limit on indemnity payments is required for rating purposes. Also, beyond some level of flooding, higher water levels cause little additional loss.

A risk analysis conducted with local stakeholders and the SIWRP revealed that flooding begins downstream when water levels exceed 250 centimeters at the Tan Chau Gauging Station, approximately a 1-in-5-year event, based on historical data. To focus the insurance product on more extreme but less frequent events (which will also reduce the premium cost), the threshold was established at 280 centimeters (a 1-in-7-year event). The upper limit was set at 350 centimeters.

1.4 Business Interruption Insurance

There are several possible approaches for transferring the early flood risk faced by the VBARD. The most direct approach would be through traditional credit default insurance. Under a traditional credit default product, the VBARD would insure its entire agricultural production loan portfolio, or that part of the portfolio at most risk from flooding. The insurance would indemnify the VBARD against specific non-performing loans.

An alternative approach is to develop insurance contracts that are tied to the expectation of loan defaults resulting from an early onset flood event. Such a product would be designed, not to indemnify against specific loan defaults, but to make a payment to the VBARD in compensation for its total loan defaults (or an insured percentage of them).

While intuitively appealing, in the context of Vietnam, there are a number of difficulties with these structures. Current banking practices rarely move bad debt off the institution's accounting books. While there are loans considered to be in default, in practice, the bank rarely writes off such non-performing debt. From a regulatory perspective, this makes it difficult to argue that the bank has actually incurred an insurable loss.

A second problem with insurance tied to loan defaults is that it opens a pathway for *subrogation*. Vietnam Law (the Civil Code) provides that, under a contract of indemnity insurance, the insurer has the right to be subrogated to the rights of the insured. It is not clear that the insurer can waive this right. In the context of credit default insurance, the insurer would acquire the rights of the VBARD to the defaulting loan against which the insurance has paid out. The insurer would therefore be able to claim against the borrower for repayment of the loan and, potentially, to enforce the claim against the borrower's assets. This works well for traditional credit default insurance as the policy pays indemnities against specific defaulting loans. However, in the case of flood index insurance, subrogation is not practicable because the insurance would serve as protection for the overall lending portfolio and a payment under the policy could not be directly associated with any individual borrower. Given that the insurer would acquire no more rights than the VBARD already has, it is unlikely that exercising the right of subrogation would be cost effective as the insurer would have the same difficulties as the VBARD in recovering payment against the borrower. Finally, structuring an insurance product solely around loan defaults ignores the other substantial costs associated with loan servicing and rescheduling.

An alternative approach is to consider the direct and indirect opportunity costs and consequential losses accruing to the VBARD when there is an increase in loan rescheduling needs caused by an early onset flood event. Since current VBARD lending practices do not include additional penalties or interest for rescheduling of loans, rescheduled loans constitute unavailable funds that the VBARD does not have to lend for future investment and production capital needs. These additional costs during times of natural disaster can be thought of as costs associated with disruption to the normal course of business and insurance that would protect against these increased costs, a form of business interruption insurance. To be specific, a business interruption insurance targets the opportunity cost and consequential losses experienced (by the VBARD) when loans are not repaid on time due to the insurable event (early flooding). It is not insurance for individual loan default risk of farmers or even the portfolio credit risk. An additional advantage of an index product characterized as business interruption insurance is that it avoids encumbering a contract with subrogation issues.

1.4.1 Calculating Maximum Sum Insured (MSI)

If it is going to use the flood index insurance product, the VBARD needs to determine how much insurance to purchase — the maximum sum insured or *MSI* in the equations above. The method developed to evaluate business interruption losses takes the observations of flood impacts from previous early onset floods and asks what would be the impact of a similar flood today. This process is generally referred to as stress analysis. It is important to consider the impact that would occur today rather than only the impact of those events in the past since the physical infrastructure, government policy, and financial position of borrowers may be different causing different expected consequential losses and costs. A Delphi technique was employed to refine the estimates of impact of early flooding. Participants in the Delphi exercises included district- and provincial-level VBARD managers in Dong Thap as well as VBARD head office managers familiar with the conditions in the province.

The valuation method was composed of three distinct steps. In brief, step one involved estimating the impact on rice harvest of early flooding of various magnitudes and, based on that information, estimating the proportion of loans that would experience problems with normal repayment. Step two calculated the value of rescheduled loans over five years for different flood scenarios and estimated the payoff rate and the number of loans not yet paid by that time. Step three applied an opportunity cost to the streams of outstanding rescheduled loan values over the five years and calculated the net present value (NPV) of the opportunity cost. This yields the maximum probable loss estimate of business interruption. Of this amount, it was recommended that the VBARD insure only a fraction, perhaps 20 percent, rather than the full amount as the insurance should work as a complement to other strategies available to the VBARD to manage its business interruption risk. The initial recommendation was for an MSI of USD 1 million which was only 13 percent of the estimated exposure for a 1-in-100-year event.

A determination of the MSI is also important from a legal perspective. It is fundamental that the insurance indemnity compensate the insured only for actual sustained losses. Allowing the insured to purchase a maximum sum insured that exceeds the maximum possible loss is to effectively allow for holding speculative positions in insurance policies. However, as discussed within the main body of this report, the insurance law of many countries allows valued policies under which the parties can pre-agree to an estimate of the value of the loss. Provided that this is a genuine pre-estimate, the insurance contract will not cease to be insurance if, when the loss occurs, the payment under the policy exceeds the actual loss sustained. The Project team considered that the Civil Code of Vietnam allows for valued policies.

In order to satisfy the criteria for a valued policy, a description and estimate of the insured's loss are critical and the index must be chosen such that if an indemnity is triggered, it is nearly certain that the insured will suffer a loss. This does not imply that the basis risk inherent in an index policy must be eliminated. What becomes important however is that the insured can never recover more than the loss sustained under a total loss. That is, the MSI under the index insurance contract must always be less than or equal to the maximum expected total loss.

1.5 Current Status

The flood index insurance business interruption policy for Dong Thap Province was offered by Bao Minh Insurance Corporation to the VBARD in 2008 and again in 2009. In each instance the contract was fully priced using commercial principles with a sum insured of USD 1 million and excess of loss reinsurance from ParisRe.

The first market test (2008) was rushed and allowances were made on the sales closing that provided enough information about water levels in the Mekong River that the VBARD could anticipate that the probability of early onset flooding was very low. The VBARD did express interest in the product and encouraged the project to continue the work so that an offer in 2009 would be made on a timely basis allowing for more time to evaluate the purchase decision.

The 2009 contract offer was sufficiently early and proceeded by two agricultural insurance education workshops as well as the preparation of additional materials specifically requested by the VBARD. The actual offer involved a formal meeting in Hanoi between representatives of Bao Minh Insurance Corporation and the VBARD. At that time, VBARD representatives expressed the need to inquire of its legal department regarding the taxation consequences of receiving indemnities after which the contract would be presented to the VBARD management. However, after further consideration, the VBARD chose not to purchase the product. Although the project has not yet received any formal feedback, one comment heard was that the VBARD had already set aside some funds to cover potential business interruption losses for the current year and thus did not think that they needed insurance. Another comment was that the VBARD did not think it would flood in 2009. If the VBARD found empirical evidence to suggest the early flooding was unlikely in 2009, this suggests that the sales closing date may need to be moved earlier in the year to avoid potential intertemporal adverse selection.

Regardless of what transpires in the future with the VBARD, other opportunities exist for an insurance product that protects against consequential losses from early flooding. A variety of firms in the value chain for rice production are exposed to this risk. These firms may be interested in the business interruption insurance product. For example, firms that are exporting high quality second season rice from the Mekong Delta should be interested. Not only are these firms exposed to throughput risk (lower amount of rice to export), they are also exposed to quality risk as early onset flood adversely affects the quality of the high-value second season rice crop. The value of exported rice exceeds USD 100 million. Early onset flooding can reduce that number by more than 10 percent.

The product can also be used to provide early payments for the consequential costs and losses for a wide range of stakeholders as they prepare for an extreme peak flood event during late September and early October. Water levels during the policy period for this insurance contract provide an excellent forecast of flooding during the peak flood season. For example, the flood insurance product would have made substantial payments in 2000. These payments would have been received just before the major catastrophic peak flooding that occurred later in the year.

As part of the market development process, and to help capture some value of the product development investment, the project is recommending that a commercial broker be identified to pursue these types of market opportunities prior to the 2010 flooding season.

1.6 Conclusion

While no policies have yet been sold, the work in Vietnam has fostered important innovations in index insurance and demonstrated some key principles. The policy being offered is one of the first index insurance products specifically designed to protect against flood losses. Flooding has unique characteristics that make it challenging to design effective index insurance products.

The flood index insurance product in Vietnam is, to our knowledge, the first business interruption index insurance policy offered to a risk aggregator. The State of Knowledge Report on Data (published in early 2010) argued that, at least in the near term, more emphasis on risk aggregator products will be required to obtain significant scale-up of index insurance products in lower income countries. While this flood index insurance product was only offered to the

VBARD, it seems likely that other risk aggregators in Vietnam could use the product to manage their exposure to the risk of early flooding.

While most index insurance products developed to date have included premium subsidies, the flood index insurance product in Vietnam is a fully-priced commercial product. It is offered by a local insurance company and is backed by international reinsurance. Further, the product has been developed to fully comply with the Vietnamese legal and regulatory context. Both the insurance product and the reinsurance agreement have been approved by the Vietnamese Department of Insurance.

Case Study 2
Drought Index Insurance: Consequential Losses to Coffee Farmers in the Central Highlands of Vietnam

Jason Hartell, Jerry Skees, and Barry Barnett

GlobalAgRisk began investigating the use of index-based risk transfer in the Central Highlands province of Dak Lak in mid-2008 with support from the Ford Foundation in Vietnam. This effort benefited from the groundwork and relationships built throughout the development of earlier market development efforts for flood risk transfer. In particular, the partnership development with Bao Minh Insurance Corporation and the ongoing cooperation with the Vietnam Bank for Agriculture and Rural Development (VBARD) enabled significant access of the team to the region which, because of recent political sensitivities, is usually fairly restricted.

Early consultations with stakeholders identified severe drought events in the Central Highlands as a serious risk to coffee production and economic prosperity for many households. Output and input price volatility is also a factor to economic well-being in the region, but among natural disasters, drought was indicated as being the most disruptive. Managing drought risk is particularly important since the coffee tree is a perennial plant, taking at least three years to establish and reach full production. Drought stress that results in coffee tree kill-off has financial consequences for the household well beyond losses of the current crop cycle.

Severe drought is fairly amenable to index insurance applications even at the farm level, though there are still difficult challenges to developing economical product delivery. Drought is usually characterized as a widespread correlated event. Nevertheless, basis risk can still present itself spatially, especially if there are microclimates in a drought zone and insufficient rainfall gauging stations to capture regional variation in drought intensity. As in all index-based insurance market development efforts in developing countries, active engagement of the insurance regulator and a thorough review of the legal and regulatory framework are necessary to minimize policy risk.

The Central Highlands region, and especially Dak Lak Province, is the major Robusta coffee production region in Vietnam. Starting in the early 1990s Vietnam expanded production and emerged as the second largest coffee exporter, mainly of Robusta beans, with Dak Lak Province contributing a third of national output. The expansion of the coffee growing in the area was a response to high international prices following a major killing frost in Brazil, then the dominant coffee producer, and government policy encouraging development of the region. Typical of agricultural booms and busts, subsequent production recovery in combination with area expansion flooded coffee markets and resulted in sustained low prices throughout the early 2000s (Jones, 2006). Low profitability resulted in contraction of the coffee area and a revision of government policy. Nevertheless, the area planted to coffee in Dak Lak has slowly recovered to near pre-2000 levels, currently standing at approximately 184,000 hectares.

Overall, Vietnam's coffee production represents its second largest agricultural export product after rice, with an export value of approximately USD 2 billion. In Dak Lak, the coffee economy accounts for 60 percent of GDP and involves one quarter of the workforce.

The structure of coffee production in Dak Lak is dominated by small farms. Individually operated farms account for approximately 85 percent of production while state-owned farms account for the balance. Fully two-thirds of coffee farms are one hectare or less with only three percent larger than 3 hectares

(Marsh, 2007). The average farm size is 1.3 hectares, and approximately 180,000 individual coffee producing households in Dak Lak. This highly fragmented structure of production has important implications for the efficient delivery of any type of agricultural insurance product.

The majority of small coffee producers take operating loans, usually just before the peak times for labor and fertilizer expenditures. As is true throughout Vietnam, the VBARD is the dominant lender to agriculture in Dak Lak, accounting for 75 percent of coffee production loans (Marsh, 2007). While there are a number of sources for short term cash needs, the overwhelming advantage of the VBARD to the coffee producers is its ability to provide the total amount of funds needed. The average loan size per hectare for coffee is between Vietnamese Dong[2] (VND) 50–60 million (USD 2,700–3,200). Farmers pay interest every month on the operating loan and the balance at the end of the year coinciding with crop sales.

The VBARD reports that lending for coffee represents approximately 62 percent of its total lending portfolio in Dak Lak, or VND 3,286 billion. As such, coffee production risk should be a major concern to the VBARD. However, the bank reports that independent coffee producers repay fairly well and that if a loan needs to be rescheduled, it is usually repaid within the rescheduling timeframe. Separate interviews with farmers confirm that they try to avoid repayment problems with the VBARD, sometimes borrowing from family or local money lenders in order to meet a shortfall. The reason is because repayment history is the greater part of the bank's credit risk assessment. Farmers care about their credit assessment less because of interest rate penalties (interest rates are mostly uniform) but rather because a poor assessment affects 1) their ability to get a loan quickly, to respond to changing fertilizer prices, for example; and 2) the amount that they can borrow.

2.1 Coffee Production and Drought Risk in Dak Lak Province

Robusta coffee production is especially well-suited to the interaction of climate and soil conditions in Dak Lak. The region experiences a single modal monsoon season which typically begins in April and runs through October. Annual average rainfall is between 1,200–1,800 mm and peaks during the August–September period. The key physical feature of Dak Lak is the basaltic soil structure that allow for high water infiltration. A shallow basalt layer sits atop a harder, less penetrable dome which results in substantial groundwater storage that is accessible by even shallow hand-dug wells. The prime coffee producing area in Dak Lak is roughly approximated by this physical characteristic. The stored groundwater is critical for coffee production as it is the primary source of irrigation for coffee trees during the dry period. Surface water from small streams is also used where available.

The coffee season is often expressed as starting in October to reflect the first onset of ripe coffee cherries. Typically, coffee cherries have reached their full development and begin to ripen just as the rainy season ends. Harvest can begin as early as October and extends into January in some areas. Peak harvest is usually the first weeks of December. Harvest operations and bean processing are aided by the cool dry weather, particularly since most small farmers dry their beans in the open before dry threshing and winnowing. During the dry period floral initiation occurs followed by dormancy. The application of the first irrigation and fertilization in mid- to late January breaks this dormancy, forcing coffee tree flowering. This initial irrigation application is especially important for uniform flowering as it also means that most of the coffee cherries ripen at roughly the same time. This is important since most small coffee growers usually strip all the beans off a plant once during the harvest period, after the majority of

[2] As of March 8, 2010, USD 1 equals VND 18,765.

the beans have matured but before they begin to fall. Uniform flowering helps to reduce the number of green coffee cherries harvested and hence improves overall harvest quality. The coffee plants are usually irrigated two more times during the dry season, spaced roughly 20–25 days apart, after which the rainy season begins.

2.1.1 Impact and Consequential Loss of Drought on Coffee Producers

Dak Lak experiences occasional drought characterized by the delayed onset of the rainy season (rains not beginning until May or June) and/or an early end of the rainy season (rains ending in September). The periods of drought vulnerability are identified on the basis of farm interviews and knowledge of coffee phenology, or coffee cropping calendar. The coffee phenology presented here is structured around the annual calendar which fully captures the distribution of the monsoon season (Figure 1).

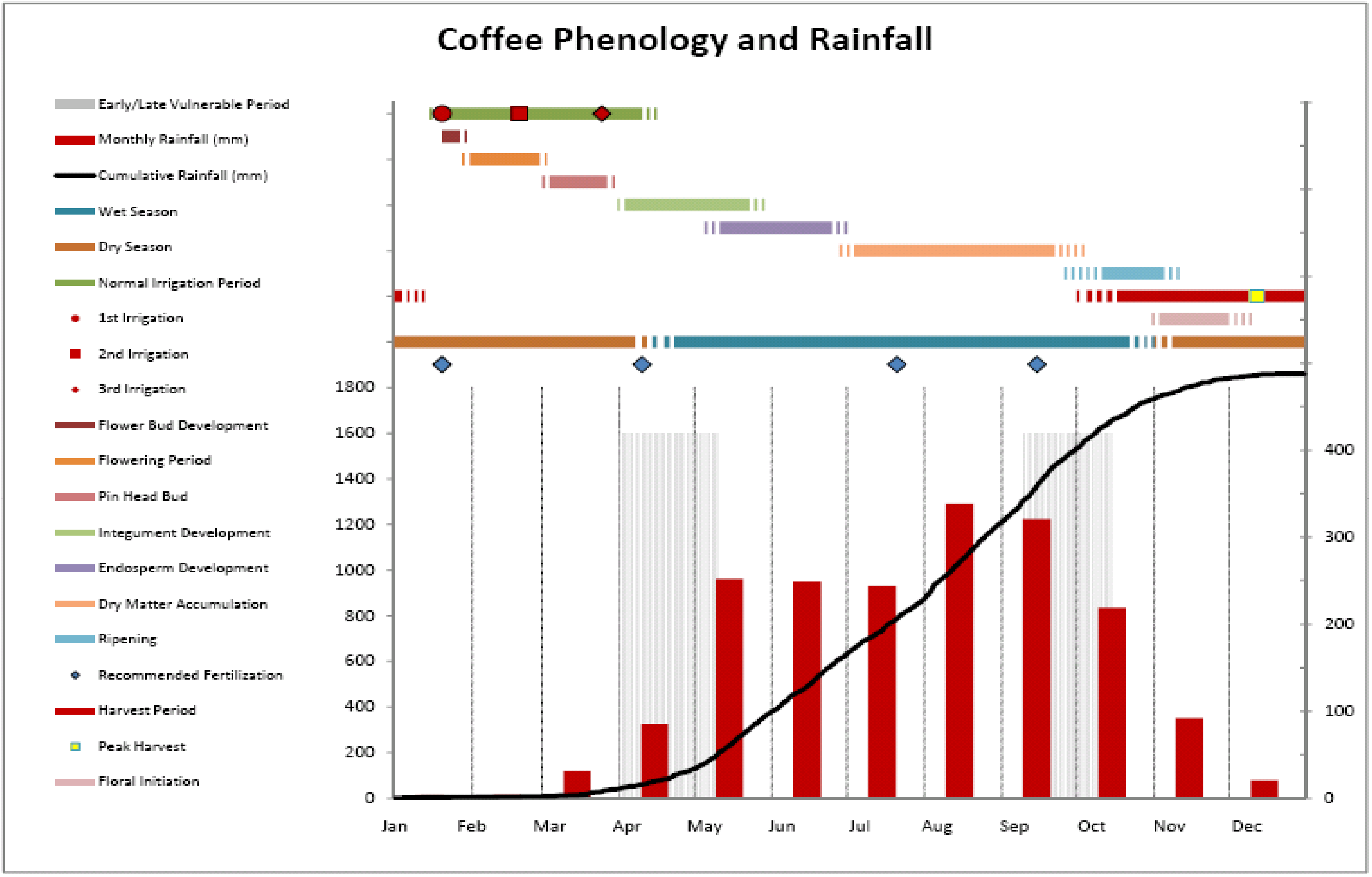
Drought during the early period necessitates additional irrigation. However, since this is following the dry season and the previous three irrigation cycles, ground water levels and free surface water are often quite reduced. The impact is to extend the typical irrigation cycle from one day per hectare up to one week in order to accommodate slowed well recharge. Severe drought can result in as many as three additional irrigation cycles. While additional irrigation is meant to preserve the coffee crop, doing so implies incurring significant additional costs. Typical expenses include fuel or electricity charges for pumping, additional labor costs, and interest charges on loans often taken for these additional irrigation expenses. Some growers must rent additional pumping units (for example, to transport water over distances from reservoirs). Growers occasionally have to purchase water with costs ranging from VND 10,000 per hour of pumping (from reservoir) to VND 2 million to irrigate one hectare from a bore well. Some farmers incur additional expense to clean and deepen hand dug wells. Coffee growers report that the extra pumping and extra labor costs can be as high as one-third of usual annual production costs.

Each additional irrigation cycle beyond normal implies an increasing yield penalty. However, choosing not to irrigate jeopardizes the coffee plant itself which represents at minimum a three year investment. Moisture stress during the early season can have a significant impact on yields as maximum potential bean size is determined by the development of the integument during this period. In addition, drought and hot, dry weather is accompanied by a higher incidence of mealybug. Mealybugs are small sucking insects which attack many parts of the coffee plant, especially new growth as well as roots, leading to stress and crop loss.

Drought at the end of the rainy season may also require incurring expenses for additional irrigation to avoid yield loss. Frequently during late season drought, farmers will also forgo the usual final fertilizer application which has consequences for yield and bean quality. Coffee quality is affected by drought stress during the maturity phase of the coffee cherry. Insufficient moisture results in beans with low mass that grade poorly and receive a heavily discounted price. In addition, lower than usual rainfall at the end of the rainy season often means that growers have to begin irrigating during the next plant cycle somewhat earlier than normal, and consequently more times, in which again they are confronted with slow groundwater recharge.

Drought, whether occurring at the beginning or end of the normal rainy season has implications beyond simple yield loss. Coffee growers are compelled to apply additional irrigation in order to preserve as much yield as possible. Not irrigating would result in total crop failure and potential loss of the coffee tree. As such, the consequential loss due to drought includes the additional expense required to respond to the drought, in addition to the increasing yield and quality shortfalls that do occur from moisture stress as the number of additional irrigation cycles increase.

Figure 1 Coffee Cropping Cycle and Rainfall Pattern, Boun Ma Thuot Station Rainfall Data, 1977–2008



Source: Authors, adapted from Carr, 2001; D'haeze et al., 2003; Dak Lak Department of Agriculture and Rural Development, 2005.

2.2 Designing a Drought Index Insurance Product

A drought index insurance product requires defining geographic areas that can be insured within which rainfall can be adequately represented by a designated rainfall station. In all cases, the risk insured is the occurrence of a "low rainfall event." A low rainfall event occurs if the cumulative rainfall as measured at the designated rainfall gauging station is less than the threshold applicable for the area assigned to that rainfall station. The insurance product is characterized as a "business interruption policy" since it is meant to indemnify the policyholder for losses and costs sustained due to a severe drought. This is more inclusive than a yield-only policy, and recognizes that coffee yield alone fails to capture the full range of impacts of drought on a coffee grower's business, as described above. The following topics address the definitions and analysis undertaken when designing the drought index insurance product.

2.2.1 Insured Cover Period

Interviews with coffee growers, examination of the coffee phenology, and analysis of rainfall data identify two principle periods of drought vulnerability. The proposed pilot insurance contract is composed of two cover periods corresponding to the drought risk:

Early cover period:	April 1–May 10
Late cover period:	September 10–October 15

The early cover period provides indemnification for the additional cost of producing coffee and/or loss in the event of lower than usual levels of rainfall during the early rainy period. The late cover period provides indemnification for the additional cost of producing coffee and/or loss (including quality) of lower than usual rainfall during the late rainy period.

2.2.2 Characteristics of Rainfall Stations and Data

Dak Lak Province and nearby boarder areas have a network of 15 climate observation stations. Of these, daily rainfall data were initially obtained from 11 stations. These were reduced to seven stations that are most relevant to coffee production. Finally, five stations were selected for the pilot based on aspects of the data and performance of the proposed contract during the selected cover periods. Daily rainfall is reported in millimeters as the cumulative precipitation during the 24-hour period from 7pm to 7pm to the following day. Rainfall stations conform to standard layouts for their type, using automatic and manual gauges. Observations from local climatologically stations are sent daily or more frequently to regional and provincial weather centers. Regional centers are responsible for data checking, cleaning, and certification before submitting the data to the national center where they are warehoused and made available for forecasting purposes. Settlement data are obtained under contract with the regional weather center to ensure timely reporting and official certification of the rainfall data used by the index insurance.

2.2.3 Insurance Zones and Designated Rainfall Gauging Stations

Each rainfall station in the insurance pilot is associated with a geographic area, called an insurance zone, and rainfall measurements collected at the station are presumed to be representative of its insurance zone. The insurable zone comprises the total of all the insurance zones. The parcel that a coffee grower wishes to ensure must be within this insurable zone. The insurance zones are delineated along communal lines. Each commune is assigned to one insurance zone and one associated rainfall gauging station. The index contract parameters, such as entry threshold values, in each insurance zone are based on the historical rainfall measured at the designated rainfall gauging station for that zone.

2.2.4 Rainfall Border Zones

Some communes may fall within rainfall border zones that consist of two or more overlapping insurance zones. These associations are based on distance between rainfall gauging stations and consideration of the overall annual distribution of rainfall. The coffee grower must chose to fully associate the insured parcel with only one of the two or more possible choices of insurance zones and associated rainfall gauging stations for determination of the index contract. The grower may make the determination of which of the zones to chose based on knowledge of prevailing weather patterns, entry thresholds that trigger contract payments, or any other criteria.

2.2.5 Underlying Index and Indemnity Function

The index-based business interruption insurance against drought is based on measures of cumulative daily rainfall measured at a designated rainfall gauging station corresponding to an insurance zone. If, during the cover period, cumulative rainfall fails to exceed a designated entry threshold, then indemnity payments will occur as a linear function based on the difference between the observed cumulative rainfall and actual rainfall during the cover period. The contract, at the exact value of the entry threshold, will pay 10 percent of the sum insured, the minimum payment. The maximum payment, 100 percent of the sum insured, is achieved when the observed cumulative rainfall is 10 percent or less of the entry threshold (OC <= .1 * ET) during the cover period. If i indicates the cover period (either early or late) then the indemnity function for period i is given by:

$$\text{Business Interruption Index Insurance Indemnity}_i = \text{SI x Payment Rate}_i$$

where SI is the sum insured,

$$\textbf{Payment Rate}_i = \begin{cases} 0 & \text{if} \quad CR_i > T_i \\ \dfrac{(T_i - CR_i)}{(T_i)} + .1 & \text{if} \quad CR_i \leq T_i \\ 1 & \text{if} \quad \dfrac{(T_i - CR_i)}{(T_i)} + .1 \geq 1 \end{cases}$$

T_i is the index entry threshold, and CR_i is the observed cumulative rainfall (in millimeters).

Contract entry thresholds for each cover period are specific to each insurance zone. The value of each entry threshold is determined on the basis of achieving uniformity in the pure risk between the insurance zones. Thus, insurance zones with lower entry thresholds imply higher relative risk compared to other areas.

This “accelerated compensating” indemnity function has several advantages over a traditional linear indemnity function (Figure 2). First, it eliminates potential miniscule indemnities by stipulating a minimum indemnity rate of 10 percent upon crossing the entry threshold. Second, payments reach the maximum indemnity at a faster rate. Third, the function compensates for the loss of small indemnities (when a linear payment rate would be less than 10 percent) with higher indemnities for increasingly catastrophic shortfalls in cumulative rainfall. In addition, the frequency of indemnities is lower and more reasonable from an insurability standpoint than for a comparable linear indemnity function, closer to 1 in 7 years as opposed to as much as 1 in 3 years for a linear indemnity function in some insurance zones.

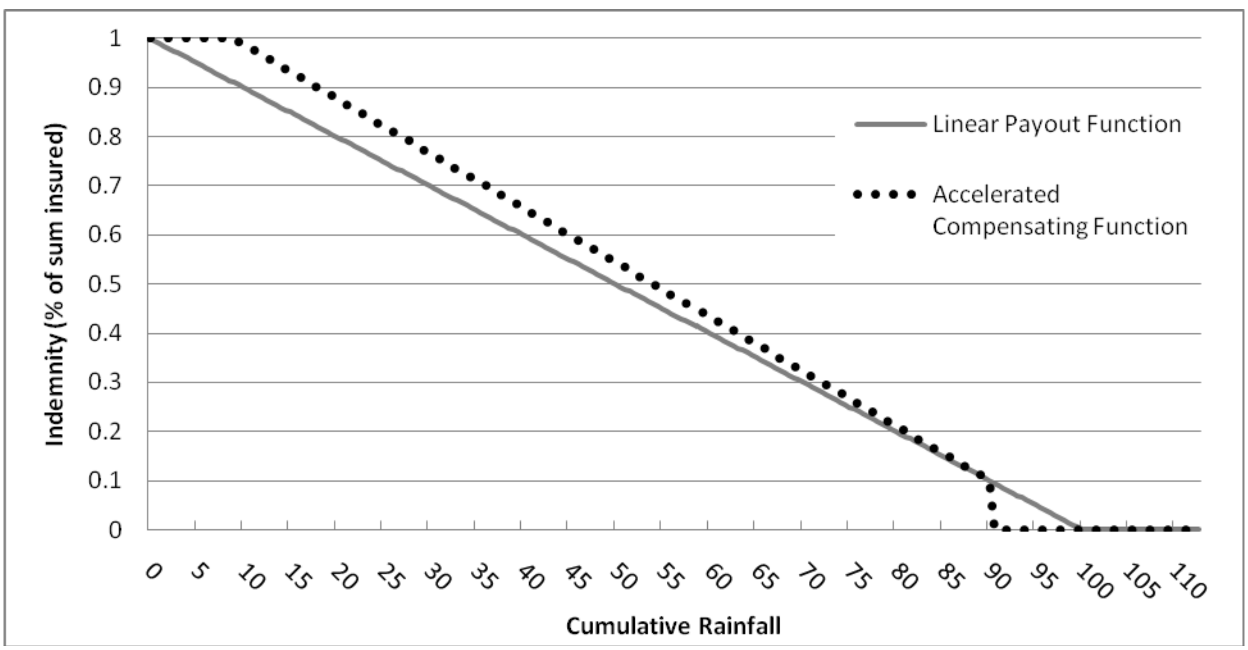
For each insured individual parcel, the insured may chose any combination of relative weight or proportion of the chosen sum insured to allocate to each of the two cover periods. The sum of the weights for each cover periods must equal 1 (or 100 percent). The option to choose the proportion to allocate between the two cover periods gives the grower an opportunity to tailor an individual contract that best reflects individual knowledge about relative drought vulnerability of the insured parcel.

Indemnity payments for each cover period are proportioned by the weight assigned to that respective period (W_i). Therefore, the total indemnity payment is the weighted sum of the indemnities for the two cover periods:

$$Total\ Indemnity = \sum_{i=1}^{2} W_i * Payment\ RatePR_i * S$$

Field survey results indicate that most coffee growers' risk is concentrated primarily in the first cover period, indicating a possible 75:25 allocation between the early and late cover periods.

Figure 2 Illustration of the Accelerated Compensating Indemnity Function



Source: Authors
Note: Example entry threshold set at 90mm with maximum indemnity occurring at 9mm

2.2.6 Maximum Sum Insured and Standard Unit of Cover

The maximum sum insured (MSI) is the upper limit on the value of insurance that an individual may purchase and represents the maximum possible loss that the insured would be expected to sustain from the insured event. For the purposes of the index-based drought insurance, the MSI is the expected value of the entire coffee crop for the insured parcel for both cover periods during the current policy year.

On a per hectare basis the MSI is:

MSI = Average Yield per Hectare x Coffee Price x Hectares Operated

A range of different prices could be used to estimate the value of a grower's coffee crop. Estimates of the cost of production per ton vary between VND 18–25 million. During interviews, coffee growers agreed to a cost of production of approximately VND 15,000 per kg although this likely includes only minimal or no return to owner labor and management. Other sources suggested a higher cost of production, which likely included a normal profit absent additional irrigation expenses encountered during drought events. In practice, growers attempt to withhold beans from the market when the coffee price is less than VND 25,000 per kg. Given this likely behavioral response, a coffee price of VND 25,000 per kg is used in the valuation of the coffee crop.

Average yield by district was calculated on the basis of area and production statistics reported by the Dak Lak Statistical Office for years 2000–2007.

The MSI for this product is expressed in terms of the Standard Unit of Cover (SUC), which is the minimum insurance contract size that a grower may purchase. One standard unit contract is set at VND 100,000. The maximum allowable sum insured is first calculated on the basis of district yield reporting and then adjusted since insurance zones associated with designated rainfall stations do not necessarily follow district boundaries (Table 1). The adjustment is made on the basis of yield reporting during focus group interviews and knowledge about the spatial variation in productivity across Dak Lak Province. For each individual insurance contract, the maximum number of allowable SUCs is adjusted based on the size of the insured parcel (i.e., multiplied by the size of the insured parcel).

The design of the product using SUCs is principally to avoid potential errors in calculations when using large numbers involving the local currency. It also naturally defines the minimum contract size.

Table 1 Maximum Number of Standard Units of Cover per Hectare by Insurance Zone

Insurance Zone	1	2	3	4	5
Station name	Buon Ho	Ea H'ding	Buon Ma Thuot	Cau 14	Buon Dray
Maximum number of standard unit contracts per hectare	470	435	537	550	630

Source: Authors

2.2.7 Forecasting and Insurance Sales Period

Forecasting activities and forecast ability are of interest due to the possibility of growers adversely selecting against the drought insurance product. The National Center for Hydro-Meteorological Forecasting oversees production of both short- and medium-long-term weather forecasts. Short-term rainfall forecasts are issued daily with a lead time of one to two days and up to three days in the major river basins to support hydrological forecasting. These weather bulletins, issued by the regional and provincial centers, are the most common forecasts available to the public.

The medium-long-term forecasts include a 5-day forecast, a monthly, and a seasonal, outlook. Monthly and seasonal bulletins are issued monthly and usually expressed in terms of temperatures, rainfall, and hydrological events predicted to be above or below normal. Hydrological forecasts, in particular, often include large errors when attempting to predict intensities (personal communication, Southern Institute for Water Resources Planning, November 13, 2009).

Research has linked drought over the Central Highlands region, which includes Dak Lak Province, to the El Niño Southern Oscillation (ENSO; Nguyen, 2006). This research concludes that drought occurrence in the early rainy season can be forecast from February sea surface temperature in the equatorial central to eastern Pacific Ocean, and that September sea surface temperature in the equatorial eastern Indian Ocean is a good predictor for the rainfall at the end of the rainy season. Canonical correlation analysis is shown to provide forecasts of early and late season rainfall two months in advance. The models show that sea surface temperatures can significantly influence the onset and withdrawal of the annual monsoon but that they are not good predictors of rainfall intensities.

It is not clear that current forecast activity makes systematic use of models employing anomalies in sea surface temperature. Given that these analysis could be possible two months in advance (depending on when measurements are taken) and that the current monthly forecasts already give indications of rainfall surplus or deficit, the Project recommended that the insurance sales closing be set no later than the end of February.

2.3 Insurance Delivery Channel Development

In developing country settings, one of the attractive features of index insurance is that the settlement does not require on-site loss adjustment, a costly proposition when there are a large number of small insured units. However, the same concern with high transaction costs applies to insurance sales. The traditional insurance agent model is not cost effective in these circumstances. Means must be identified that enable groups of coffee growers to be approached or for the product to be available at points frequented by individual growers.

The VBARD has 64 branch offices in Dak Lak Province. This network could position the bank's branch offices as an efficient point of sale for drought index insurance. However, during delivery partnership development meetings, the VBARD opted not to participate.[3]

[3] Also, as a potential holder of credit risk, the VBARD showed little interest in alternative financial instruments such as index based drought insurance to protect part of its lending portfolio as it has access to a low cost "risk management fund" for writing off bad debt.

Because the VBARD was not interested in sales from its extensive branch offices (and also because the Project was concerned about potential unintended tie-ins between insurance purchase and lending activity), the local insurance partner, Bao Minh Insurance Corporation, had to develop another delivery channel mechanism. Field survey responses showed that growers are also concerned with potential travel costs and time requirements to purchase the insurance. Their point of reference is the effort needed to obtain annual financing which usually requires travel to the district center. Insurance sales will be more effective if grower travel can be minimized.

In Vietnam, there are two models for an insurance company to recruit independent sales agents. First, they can be contracted as independent individuals that receive commission for policy sales. The second method is to contract with an organization which then has individuals serving as agents. In this case, it is the organization that receives commissions from policies sold. Individual agents may or may not receive compensation. The latter option is often preferred since it somewhat reduces the transaction cost of working with numerous independent agents. However, the insurance company loses the ability to ensure proper incentives by ceding control of the entire commission to the organization.

Agent commission rates, whether organizational or individual, are set by the Ministry of Finance at 20 percent of the premium value for agricultural products. Furthermore, regulation forbids the use of bonuses, kickbacks, or other devices to provide incentives or compensation beyond the set commission rates.

2.3.1 Agricultural Extension System as Delivery Agents

It was decided by the provincial level insurance company branch office to approach the Agricultural Extension Center (AEC) to cost-effectively market, sell, and service the drought insurance throughout the insurable zone. The Vietnamese extension system is hierarchically structured; policies and extension programs are designed at the national and province levels, whereas the district and communal levels are mainly focused on implementation. The extension network is part of the Ministry of Agriculture and Rural Development through which financial and technical inputs are delivered via the National Agricultural Extension Center. However, the People’s Committee at different levels has significant influence on the overall structure of the network. Provincial-level AEC directors apparently have authority to engage in commercial activities to the extent that it benefits growers and/or the mission of the AEC. As elsewhere, the function of the extension network is to provide advisory and support services to both individuals and farmer organizations.

The extension network extends from central offices at the provincial level to part-time personnel at the communal level. The provincial office oversees 14 district offices, or extension stations, with at least one station per district. Each of these stations has four to five salaried employees having at least a Bachelor’s degree. At the next level, there are 180 communal extension workers, one per commune. The extension agent is always a resident of the commune and on a yearly contract with the district extension station. Although salaried, the communal agent is considered to be a part-time employee.

The rationale for using AEC personnel as sales agents is their unique ability to identify and organize groups of farmers as part of their normal educational function. This ability was demonstrated to the Project and the insurer when extension network agents were able to rapidly organize farmers across several different districts to participate in coffee grower surveys. The AEC is generally thought of as trustworthy by farmers and it is hoped that AEC agents, wanting to maintain this relationship with farmers in order to conduct their usual extension activities, will endeavor to not misrepresent the drought insurance product to farmers solely for possible short-term commission income.

Bao Minh Insurance Corporation has undertaken the necessary steps and provided insurance training for 10 individuals at the district level of the AEC. The insurance training comprises two components: a standardized general insurance training and training on the specifics of the drought insurance product. The agent certification process stipulated by the Ministry of Finance requires an examination at the conclusion of the training in order for individuals to be licensed agents. The idea is for district agents to subsequently train communal staff on very basic insurance principles and components of the drought insurance to ensure consistency in information content, particularly in terms of ensuring the correct characterization of the index-based drought insurance product.

Bao Minh Insurance Corporation already has a protocol in place that describes the duties and responsibilities of contract agents, including guidelines and controls for cash and policy documentation handling, commission payment, etc., which applies to AEC agents as well. The Bao Minh Dak Lak branch office will negotiate the final terms of delivery channel partnership with the AEC for this pilot test of the insurance product and delivery system, but indicates that it desires individual contracts with the AEC delivery agents.

2.4 Legal and Regulatory Issues

Many of the initial legal and regulatory hurdles accompanying index insurance for consequential loss were examined by the regulator while developing the Vietnam flood index insurance product. Nevertheless, as this is the first-ever consequential loss product for households, the Project, over the course of developing the drought product, met with the regulator to emphasize the differences between the two products and to ensure that regulatory approval was maintained. While the drought index insurance contract must still possess the main provisions in order to be a valid insurance contract, the distinctions between a product designed for a risk aggregator and one for individual farmers are quite important. These distinctions include carefully defining who holds the insurable interest, describing consequential loss and MSI in such a way that it satisfies the compensation requirement and that the threshold levels of the contract are agreed to represent a clear consequential loss.

- The person/entity insured must usually have an insurable interest in the object insured;
- The person/entity insured must suffer a loss on the happening of the insured event; and
- The payment made to the insured by the insurer must represent an indemnity or compensation for that loss.

For individual coffee producers operating on their own or rented land, the insurable interest is straightforward. However, for individuals operating under the umbrella of state-owned coffee companies it is unclear who carries the insurable interest. Being able to clearly partition the insurable interest, and hence the maximum MSI between parties, is not straightforward and can vary between enterprises. For the insurance pilot, it was decided that at least during the initial stages, state-owned enterprises and growers operating on state-owned land would not be eligible to purchase insurance. Later, if there appears to be demand, these organizations may be incorporated, with adequate procedures to identify and document the appropriate division of insurable interest.

Another issue involves the procedures to establish and document the MSI in order to comply with the provision that an indemnity represent compensation for loss, i.e., insureds are not allowed to hold speculative positions in insurance policies. While the MSI is established on a per hectare bases for each insurance zone, individual policy holders must declare the actual size of the insured parcel. While various means exist to document the declaration, it would be cumbersome to require this be provided at the time of policy purchase. Instead, the policy contains language that gives the insurer the right to demand this documentation from the insured in the event an indemnity is due. In practice, if an indemnity is due, the insurer will likely examine the area's declaration of policies and, in consultation with the selling agents, select only those that are questionable to require the necessary documentation.

2.5 Current Status and Conclusion

A major milestone in the market development process was achieved with the offer and acceptance of reinsurance by a major international reinsurer for the drought insurance pilot product for policy year 2010. The reinsurer, however, was concerned about the possibility of ENSO effects being present and already detectible in the early cover period. To avoid having different premium rates for each cover period, it was elected that the pilot only offer the second cover period product. This allowed the extension of the sales period to the end of March and still enables the important educational function of the pilot to continue with initial contact by agents with farmers anticipated the first weeks in March. In subsequent years, following this period of learning and adjustment, the product will be available much earlier, allowing policy sales of both the early and late cover periods.

The drought index insurance product is a fully priced commercial product at this stage. The government of Vietnam indicates that it will provide subsidies for agricultural insurance pilot projects but this has yet to materialize. In designing the product structure based on SUCs, the project has argued that the government might provide a match of some multiple of the SUCs purchased by the individual grower, rather than providing a premium subsidy. The reason is because the premium subsidy is usually paid directly to the insurance company and, because of this lack of transparency, growers never see the actual price of the drought risk.

As a product targeted to individual coffee producers, designing and implementing the drought insurance has been a significant undertaking requiring significant levels of coordination between GlobalAgRisk and the headquarters and branch offices of Bao Minh Insurance Corporation. The market development effort has involved not only education with regard to index insurance, but also with regard to conceptualizing and developing alternative product delivery channels.

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Case Study 3
El Niño Southern Oscillation (ENSO) Index Insurance in Piura, Peru

Benjamin Collier, Jerry Skees, and Barry Barnett

In 2004, COPEME (Consorcio de Organizaciones Privadas de Promoción al Desarrollo de la Micro y Pequeña Empresa) with funding from the U.S. Agency for International Development (USAID) invited GlobalAgRisk to Peru's northern coastal region of Piura, to improve access to credit through natural disaster risk management. Risk assessments clearly indicate that access to credit is most severely constrained by risks associated with extreme El Niño, which causes severe flooding in northern Peru. The largest microfinance institutions (MFIs) in Piura are the municipal banks (cajas municipales) so the project began collaborating and building capacity with these banks.

The work continued in 2005 and 2006 under a project directly supported by USAID and resulted in an index insurance product designed to protect against extreme El Niño events.[4] The index insurance would pay indemnities based on unusually high sea surface temperatures off the coast of Peru, an important indicator of El Niño events. The product, which received approval, in principle, from the Peruvian banking and insurance regulator, Superintendencia de Banca, Seguros y AFP, República del Perú (SBS), was designed for firms such as the cajas that have significant financial exposure to El Niño events. In 2006, the Peruvian government announced its intention to subsidize traditional agricultural insurance. Such insurance could have significant implications for regions with large agricultural sectors such as Piura. This announcement generated extensive interest from insurers in Peru along with farmers, banks, and other stakeholders in Piura. As a result, it was decided that advancing insurance against extreme El Niño events should be postponed until the political uncertainty regarding subsidized agricultural insurance was resolved.

The outcome of the government subsidy program was a catastrophic agricultural insurance that was deemed to have very little overlap with the ENSO index insurance product developed earlier. So in 2009, GlobalAgRisk resumed their work on the Peruvian ENSO index insurance with support from the Bill and Melinda Gates Foundation. La Positiva, a local insurance company with a reputation as a local innovator, partnered in this effort. In May 2009, the SBS approved the contract language for the ENSO index insurance (hereafter, ENSO Insurance). As is explained below, indemnities are determined based on November and December sea surface temperatures measured off the coast of Peru and indemnities are paid in January before catastrophic flooding begins in February. Collaboration and capacity building with the cajas has continued. In addition, the efforts have extended to other firms exposed to extreme El Niño events including agricultural value chain members such as farmer associations and commodity exporters. The first insurance marketing and sales season for ENSO Insurance effectively began in December 2009. The sales closing date is March 31, 2010.

[4] For the purposes of this case study, El Niño Southern Oscillation (ENSO) refers to the oceanic and atmospheric processes in the equatorial Pacific Ocean. Generally, a period of sea surface warming in this region is referred to as El Niño and a period of cooling is La Niña.

This case study describes the development and capacity building efforts for ENSO Insurance. First, it explains the effects of extreme El Niño in Piura in terms of losses associated with the event as well as the effects of this exposure on market conditions. Second, the case study describes the insurance product design. Third, it provides the key regulatory considerations developed with the SBS. Fourth, the case study describes education and capacity building efforts with the cajas and members of the agricultural value chain. Opportunities for increasing incentives for the cajas to purchase ENSO Insurance through the banking regulation and credit rating agencies are discussed. Finally, the case study describes the marketing and sales activities currently underway.

3.1 Background: Piura and El Niño Risk[5]

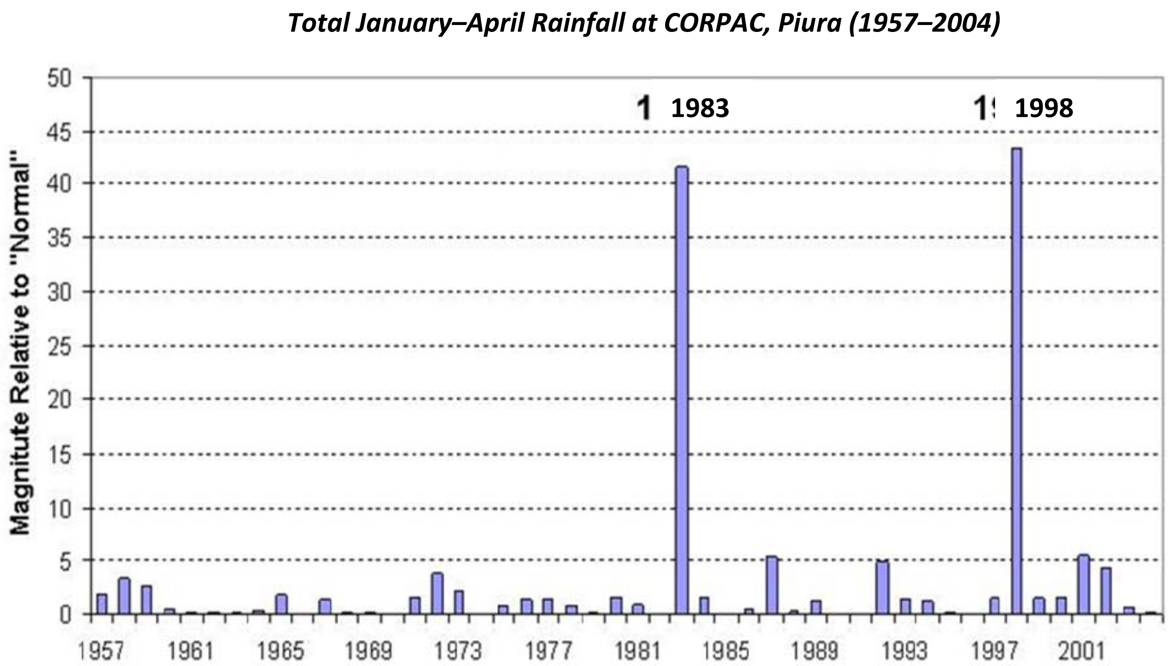
Piura is one of the most productive agricultural areas of Peru. Piura produces both export and domestic crops including cotton, rice, corn, and other grains, beans, coffee, and tropical fruits, as well as livestock. Agricultural production in Piura accounts for nearly 5 percent of the national gross domestic product (GDP) for agriculture, and represents 10 percent of GDP within Piura with a value of roughly USD 200 million (INEI, 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 (Banco Central de Reserva del Perú, 2008).

The two important agricultural regions in Piura are situated along two major rivers — the Piura River and the 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). Extreme flooding in Piura is directly tied to elevations in the sea surface temperature measured off the coast of Peru. Climate models demonstrate that major increases in equatorial Pacific Ocean sea surface temperatures 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.

In Piura, the consequential losses and problems associated with extreme rainfall and catastrophic flooding are enormous — crops are lost, trees die, soils wash away, transportation systems break down, disease problems (e.g., malaria) increase, and markets are destroyed. When individuals and local markets suffer in this fashion, firms in the value chain and the financial sector also tend to suffer. Figure 3 shows the historical magnitude of January–April rainfall relative to normal levels in Piura. The years 1983 and 1998 are extreme outliers with rainfall levels more than 40 times greater than normal. The volume of water in the Piura River was also about 40 times the normal level in these two years.

[5] Much of the material in this section is taken from Skees and Collier, 2010, and Skees and Murphy, 2009.

Figure 3 Extreme El Niño Events of 1982/83 : 1997/98



Source: Authors

Both the 1983 and 1998 flood events were preceded by elevated sea surface temperatures off the coast of Peru. In 1998, with a clear indication that El Niño was coming, farmers simply did not plant crops, resulting in a 27 percent drop in fertilizer sales in northern Peru. Agricultural lending was growing at a significant pace before the 1998 El Niño. The growth completely stopped after the event. Because of the 1998 El Niño, the default rate on agricultural loans issued by MFIs in Piura increased from about 8 percent to over 18 percent.[6] Caja Piura, a leading MFI in Piura, restructured an estimated 3.8 percent of its total loan portfolio due to this event. Additionally, as depositors withdrew funds to cope with the El Niño, deposits — a major source of capital for MFIs — were reduced by roughly 15 percent. Increased loan defaults and loan restructuring along with deposit withdrawals converged to create significant liquidity and profit problems for the MFIs from which it took at least three years to recover.

3.2 ENSO Insurance as a Form of Business Interruption Insurance for Consequential Losses[7]

Although extreme rainfall is the immediate cause of damage in Piura during El Niño events, rainfall insurance was determined to be infeasible. Rainfall data from inspected stations during

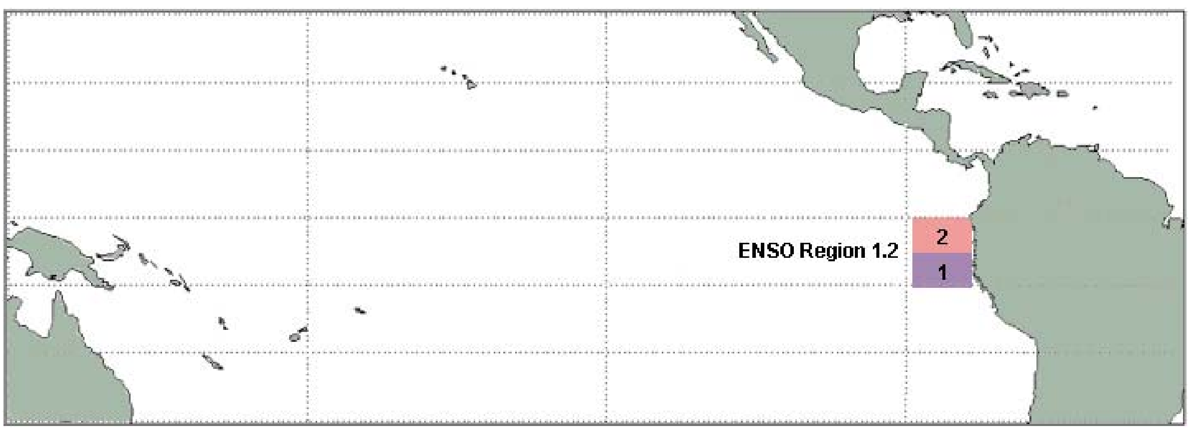
[6] Loan default is defined as loans that were 60 days late or more in payments. Once loans fall into this category, the probability of collection is nearly zero.

[7] Much of the material in this section is from Skees and Murphy, 2009.

previous work in Peru as well as volume and flow data for the two reservoirs that supply the major river valleys suggest 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 was not feasible and would have added significant complexity to product design.

Instead, the focus shifted to the relationship between sea surface temperatures and extreme rainfall-induced flooding. The U.S. National Oceanic and Atmospheric Administration (NOAA) generates several sea surface temperature measures that correspond to different regions in the Pacific Ocean. One of these is a composite region, ENSO 1.2, comprising ENSO Regions 1 and 2 (Figure 4). Using NOAA data,[8] our analysis, in collaboration with climate experts from Columbia University and The Ohio State University, demonstrated that El Niño induced flooding in Piura could be predicted using the ENSO 1.2 index. Technical experts at the Peruvian Ministry of Agriculture were also in agreement that measurements from ENSO 1.2 provide ENSO indicators that are highly correlated to extreme flooding in Piura.

Figure 4 Composite ENSO Region 1.2[9]



Source: Authors

Clear advantages of basing an index insurance contract on an ENSO measure are that the measurement is fully transparent to all parties and is developed by an independent and objective third party source. Thus, these features of this index insurance product are fully consistent with major advantages of index insurance: the contract can be made effectively free from adverse selection and moral hazard.

Work performed in January, 2009, demonstrated that the average ENSO 1.2 measures for the months of November and December predict extreme February–April flooding events with a very high confidence level. Thus, it is possible to write an ENSO index insurance that pays indemnities in January, and these funds can be used to mitigate flood damage before the flooding actually

[8] 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.

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

begins in February. This is a highly significant innovation. The correlation between the average November and December ENSO 1.2 measure and the average January to March ENSO 1.2 measure is 91 percent for years when the ENSO 1.2 measure is above the median level. The historical indemnities for a contract written using November and December average ENSO 1.2 would have been nearly identical to those for a contract written using the average January to March ENSO 1.2 measure. Thus, for an ENSO Insurance product with sales closing of March 31 of year t, the average ENSO 1.2 values for November and December of year t are used to calculate indemnities that are paid in January of year t + 1.

The ENSO Insurance is written as a business interruption insurance policy to be used potentially by any legal entity in Peru exposed to extra costs due to catastrophic flooding as predicted by extreme November and December ENSO 1.2 measures. The product designers specifically considered "risk aggregators," those firms that provide important services (e.g., credit, production technologies such as fertilizer) to households exposed to El Niño. Business interruption insurance is designed to compensate for lost profits or extra costs that occur as a result of the insurable event. For example, business interruption costs for the cajas can include extra costs of finding capital during or after the extreme event, losses incurred restructuring loans, and ultimately, extra costs associated with defaulted loans. Assessing consequential losses including business interruptions is extremely difficult; therefore, a simplified form of loss adjustment for the ENSO Insurance was adopted and accepted by regulators, in place of more traditional loss assessment processes for business interruptions (e.g., business revenue losses created by an event like a building fire that disrupts normal business).

ENSO Insurance indemnities are paid when the average of the November and December ENSO 1.2 measures exceeds 24.5 degrees Celsius. The maximum indemnity is paid when the measure equals or exceeds 27 degrees Celsius. Specifically, the indemnity function is[10]

Indemnity = Sum Insured x Payout Rate

and the payout rate[11] is calculated as:

$$\textit{Payout Rate} = \min\left[1.00, \max\left[0, \frac{(\textit{ENSO Index} - 24.5)}{(27 - 24.5)}\right]\right]$$

The insured selects a sum insured that is less than or equal to a maximum amount determined by a risk assessment that estimates the largest losses that may occur under the worst flooding event. The SBS could require documentation of these estimates. Prudent insureds will be more likely to select a sum insured that is less than the maximum allowable given the expense of this type of catastrophe insurance.

[10] The word indemnity is used to mean the payouts from the insurance policy and not the type of insurance policy. The ENSO Insurance is a contingent insurance policy as it is developed.

[11] Using this calculation, the payout rate in 1998 would have been 71 percent. A contract that triggers at 24.0 degrees Celsius is also available. The payout rate in 19998 would have been 76 percent for that contract.

3.3 Building Capacity among MFIs for Use of ENSO Insurance

As indicated earlier, when GlobalAgRisk began working in Piura in 2004, the purpose of the project was to introduce risk management mechanisms that improve the poor's access to and the terms of lending. Risk assessment analyses led to a focus on the El Niño risk exposure of the primary MFIs that serve the poor in this region, the cajas municipales, and the risk assessment advanced during continued interaction with the cajas. Information about the cajas was obtained directly from the cajas and from the SBS website, which provides some information on the lending and savings portfolios of the cajas. Through continued discussions, the cajas shared their El Niño risk management strategies and an understanding of the cajas' risk exposure developed.

Extreme El Niño events are a risk that permeates practically all aspects of caja banking activities:

- It creates loan problems in many economic sectors. El Niño not only causes loan defaults in the traditionally more vulnerable economic sectors such as agriculture, but El Niño destroys bridges, washes out roads, and damages personal property. Markets are significantly disrupted. Thus, El Niño creates problems for other economic sectors such as small and medium enterprises, transport, hospitality, service, manufacturing, etc.;
- Poorly performing loans increase operational costs associated with refinancing and restructuring these loans;
- Regulations require the cajas to increase their specific provisioning for troubled loans;
- Depositors withdraw their funds to manage the emergency;
- These problems converge to create a sudden demand for liquidity by the cajas;
- To the extent that the savings and capital reserves that the cajas currently hold are insufficient to meet this demand, they must borrow from other institutions, typically at a higher than normal cost of capital; and
- The liquidity crisis also limits the amount the cajas can lend in the future, creating a significant opportunity cost in the form of foregone lending opportunities.

Together, all of these factors imply that El Niño results in significant profit declines and a multi-year recovery process for the cajas.

GlobalAgRisk is currently involved in capacity building discussions with the cajas, a valuable learning experience. We typically meet with managers and some of the credit analysts for each caja. The caja managers must, of course, balance the current cost of insurance premiums with the benefit of improving resilience to extreme El Niño events. We perceive the cajas to be highly motivated to grow their business in the short term, perhaps due to the influence of their boards of directors. To the extent that the cajas have a short-term focus, they significantly discount the future benefit of resilience to extreme El Niño events compared to the current cost of purchasing insurance. Thus, we have maintained a dual focus during our discussions with caja managers. We consider how including insurance as a component of their disaster risk management strategy can 1) reduce the costs and improve recovery time when extreme El Niño occurs; and 2) improve their performance in normal years. We have framed this as part of a strategy for *sustainable* growth. We believe that the cajas clearly see the value of ENSO Insurance during El Niño years. We anticipate that at least one or two of the cajas will take a conservative insurance purchasing position over the next few years based on the anticipated benefits during El Niño years. However, because of the perceived short-term focus of the caja managers, we believe that the cajas may only take a strong position on insuring their El Niño exposure if they recognize more of the benefits of the insurance in normal years.

We have introduced the cajas to a number of ways in which the insurance could enhance their performance in normal years. For example, we anticipate that purchasing the insurance could allow the cajas to increase their lending presence in vulnerable economic sectors that experience higher risk but also yield higher returns. When we engage the cajas in these types of complex discussions, they generally conclude by wanting their credit analysts to conduct cost-benefit analyses. Thus far, follow-up discussions generally indicate that these analyses have not been conducted — an outcome that can be attributed to the many immediate demands on caja employees. In our view, the cajas will actually have to purchase the insurance to gain some experience with it and to justify the credit analysts spending more time evaluating the benefits of the product for normal years. This conclusion, in part, has driven our recommendation to the cajas to conduct a pilot study in the first year, concentrated on a geographic region that is highly exposed to El Niño.

Our work with the cajas is built on the premise that improving their ability to manage natural disaster risk should improve their solvency, which over time should increase access in the community to the services of the cajas and enhance their services to the poor. Because evaluating and improving solvency is also an important goal for the banking regulator and credit rating agencies, we began considering how ENSO Insurance might fit into the incentive structure these stakeholders provide to the cajas. Our approach is to work within the banking environment in Peru to highlight the importance of natural disaster risk management, especially risk of extreme El Niño, based on our premise: if an insurance product such as ENSO Insurance can be shown to smooth profits and increase solvency for the cajas, the banking regulator and the credit rating agencies would want to recognize this when evaluating the cajas that purchase ENSO Insurance. We are still in the process of collaborating with the banking regulator and the credit rating agencies. Our ultimate goal is finding those mechanisms within the current banking environment that could explicitly demonstrate the benefits during normal years if the cajas chose to purchase the insurance.

3.4 Working with the Banking Regulator

This section discusses potential opportunities for using ENSO Insurance as a partial substitute for bank capital in the areas of capital adequacy requirements (CAR), specific and general provisioning, and liquidity risk management. We have been discussing these issues with the SBS, which is also in the process of implementing changes in banking regulations similar to those proposed in the Basel II Accord.

In many ways the cajas are more sophisticated than typical MFIs. They manage large portfolios (e.g., USD 100 to USD 400 million) and are categorized as MFIs because their primary clientele are smallholder households. For example, from 2001 to 2005 the average loan size for all the caja municipales in Peru was between USD 1,200 and USD 1,800 (Trivelli, 2006). They are regulated as both a lender and a deposit-taker. The level of regulatory oversight in Peru is quite strong for a lower income country, especially when compared to that experienced by MFIs operating in many other countries. Thus, there are several reasons to believe the cajas may use more sophisticated operational processes than typical MFIs. Under international banking standards such as Basel II, the more sophisticated the bank, the more flexibility it has managing its risks. However, as we describe below, the relative sophistication of the cajas is still insufficient to create flexibility under Basel II or current Peruvian regulations for using ENSO Insurance as a substitute for capital.

3.4.1 Capital Adequacy Requirements (CAR)

CAR attempt to ensure that financial institutions have sufficient capital to meet their liabilities given the risks to which they are exposed. CAR are determined based on three categories of risk:

1. Credit risk, the possibility that a borrower will not fulfill the agreed upon terms of the loan;
1. Operational risk, the potential for losses during the implementation of the business practices of the financial institution; and
2. Market risk, the risk of losses due to movements in market prices including foreign exchange, interest rate, and commodities risks.

Natural disaster risk is considered a component of operational risk. For example, the increased costs of restructuring loans due to a natural disaster are a component of operational risk. However, there is an increasing recognition of the interrelatedness in credit, market, and operational risks (BCBS, 2006; Greuning and Bratanovic, 2009). El Niño is a good example. As described above, El Niño certainly creates credit problems for the cajas and increases operational costs. Likewise, because El Niño has such a pervasive effect in Peru, it creates market disturbances. For example, the 1998 per capita GDP growth rate in Peru was -10 percent (Hesten, Summers, and Aten, 2010).[12]

The SBS has implemented regulations on credit risk (SBS, 2009a), operational risk (SBS, 2009c), and market risk (SBS, 2009b) that are quite similar to Basel II. In fact, these regulations begin with a statement explicitly identifying the intention of the regulator to implement the recommendations of the Basel Committee of Bank Supervisors. The Peruvian regulator tends to be relatively conservative. As an example, under Basel II (paragraph 5, BCBS, 2006), banks must hold capital at a minimum of 8 percent of risk-weighted assets; in Peru, banks must hold capital equaling 10 percent of risk-weighted assets (Article 7, SBS, 2009a).

Credit Risk. In Peru, banks can choose to have their credit risk assessed by either the Standardized Approach or the Internal Ratings-Based (IRB) Approach. The Standardized Approach is the default approach that uses national standards to determine capital requirements depending on the credit rating of the borrower assigned by a credit rating agency. In contrast, the IRB Approach allows banks to calibrate their credit risk based on their internal risk modeling systems, which rely on historical portfolio performance and expectations regarding current economic conditions. For a bank to qualify for the IRB Approach, it must demonstrate to the regulator that it has internal modeling systems that can accurately estimate the aspects of credit risk and dynamically manage these risks.

One potential role for ENSO Insurance in the context of credit risk would be to reduce the level of risk-weighted assets held by the bank by classifying ENSO Insurance as a credit risk mitigation

[12] While the 1997 Asian financial crisis may have contributed to this GDP decline, researchers recognize the detrimental effects of the 1997-98 El Niño on GDP growth in Peru (Hochrainer, 2006; McEntire and Fuller, 2002).

mechanism. ENSO Insurance is a mechanism that can reduce credit risk; however, the very specific standards for credit risk mitigation mechanisms recognized by the SBS prevent classifying ENSO Insurance in this category — namely, credit risk mitigation mechanisms are intended to be quite similar to specific provisions in that they are dependent on the performance of the loan and they carry a standard of legal certainty. In contrast, ENSO Insurance payments are not determined by the performance of a specific loan. Thus, the SBS could not identify a justification under current Peruvian regulation for classifying ENSO Insurance as a credit risk mitigation tool.

The SBS reports that credit risk regulation provides more leeway for financial institutions using the IRB Approach to implement mechanisms such as insurance to manage their credit risk. Banks using the IRB Approach use their internal modeling systems to manage risk and could potentially identify a reduction in exposure associated with ENSO Insurance that would reduce their CAR. The SBS reports that the cajas do not employ the IRB Approach because they do not use sufficiently sophisticated credit risk modeling systems.

Operational Risk. As mentioned previously, when regulators consider operational risk, they specifically consider the exposure of the bank to natural disasters, so it seems to be the most likely place that ENSO Insurance purchasing could affect CAR. There are three approaches for assessing operational risk: the Basic Indicator Approach, the Standardized Approach, and the Advanced Measurement Approach (AMA). The AMA is the most sophisticated approach. Under the AMA, banks must use internal modeling systems to create a risk profile based on historical losses and their current business activities. Under the AMA, banks in Peru can recognize insurance as a component of their capital charge. Insurance can substitute for up to 20 percent of the capital requirement for operational risk (Article 18, SBS, 2009c). However, the cajas do not currently qualify for the AMA. The SBS indicated that no bank in Peru currently used the AMA. To some degree, banks may not have adopted the AMA because the transition to Basil II has been so recent in Peru (e.g., SBS Resolution 21152-2009 was published in April, 2009).

Market Risk. While Peru has adopted Basel II-type regulation on market risk, the cajas do not manage trading portfolios, so market risk regulation only applies tangentially. For banks that are not trading, currency risk and commodity risk are the two primary areas of market risk. The cajas hold a mixture of Peruvian and foreign currency to manage currency risks. Like regulation on credit risk and operational risk, market risk regulation indicates that banks with the ability to internally model their risk can use methods for establishing CAR that allow for increased flexibility

3.4.2 Specific and General Provisioning

Provisioning describes identifying capital for the specific purpose of managing a loss. This is in contrast to capital reserves which are held in a more general fashion and can be used for more purposes. Specific provisioning covers problems that develop with a specific loan while general provisioning covers future potential losses in a loan portfolio.

Specific Provisioning. Specific provisioning levels are determined by the regulator based on the likelihood of repayment for that loan. In Peru, banks rate borrowers in terms of a 0 to 4 scale where 0 indicates that the expected repayment is normal and 4 indicates the loan is considered lost (SBS, 2003, SBS, 2008). Because this provisioning is based on the evaluation of a specific loan, an insurance product for a risk aggregator, such as ENSO Insurance, is not an appropriate substitute.

General Provisioning. General provisions, also called loan loss provisions, are funds set aside to address future problems in a loan portfolio. General provisions are not associated with a specific loan because the bank does not know which loans will perform poorly in the future; rather, general provisions are created based on expectations regarding the loan portfolio due to historical performance and expectations about the future business environment (Borio and Lowe, 2001).

It may be possible for ENSO Insurance to act as a substitute for general provisions given approval of the regulator. Because general provisions are based on expected portfolio performance, a strong case can be made that vulnerability to a specific natural disaster such as extreme ENSO is expected to have significant effects on portfolio performance. If ENSO Insurance can be shown to reduce the exposure of the cajas, the SBS might be willing to consider allowing ENSO Insurance as a substitute for general provisions held because of extreme El Niño risk. We are not currently well-versed in the Peruvian regulation regarding general provisions; however, we consider this a promising research endeavor and are pursuing it.

3.4.3 Liquidity Risk

Liquidity risk describes the possibility that a financial institution may need to increase its liquidity and is unable to do so without incurring large losses — e.g., from an increased cost of capital in the marketplace. Liquidity risk is not managed under Basel II but is another important area of risk for the cajas. The SBS is actively involved in setting standards for liquidity risk.

One source of liquidity risk is when a bank obtains its capital primarily from a single source. A large portion of the capital for the cajas comes from savings and term deposits — up to 80 percent for one of the cajas in Piura. Since the last severe El Niño, the cajas have increased the geographic diversity of their deposit holdings. It is unclear how the next severe El Niño will affect deposits. It is clear that the next severe event will increase specific provisioning and operational costs. We are not yet well-versed in the practices of the Peruvian regulator for managing liquidity risk; however, given the significant liquidity problems severe El Niño creates, we consider this a promising area for future discussion and research.

3.4.4 Summary

From our work with the SBS thus far, there is no clear place for ENSO Insurance to count toward the CAR for the cajas. However, two interesting themes emerge. First, ENSO Insurance is likely most beneficial in a context of sophisticated risk management. Banking regulators recognize that credit, operational, and market risks are interrelated, yet these risks are calculated independently under the most basic approaches. More advanced approaches motivate banks to evaluate their risks in a dynamic, fluid way, a way that is not possible for an external regulator. ENSO Insurance is a simple and flexible instrument. While it is unclear what the specific magnitude of the next severe El Niño will be, it is clear that it will create both credit and operational losses for the cajas. Thus, ENSO Insurance fits nicely in a bank management model that is fluid so that the bank can use the insurance payment for whatever purpose it needs. Despite these benefits, the banks that are likely most exposed to regional disaster risk, MFIs such as the cajas, are the least likely to have the risk management capacities to adopt the more sophisticated approaches outlined above.

Second, current regulations motivate increased risk management capacities for the cajas. Improved risk management systems would allow the cajas to more effectively assess their credit and operational risks and would likely help them operate more efficiently as their capital adequacy holdings would more closely match their risk profiles. While it is beyond the scope of our project to facilitate the development of the IRB Approach or the AMA, one of our primary intentions is to improve the risk management systems of the cajas. Thus, our work to improve El Niño risk management through use of effective insurance mechanisms and risk management planning is in line with progressive regulation in Peru and we hope will contribute to the broader goals of the regulator of creating more stable financial institutions.

3.5 Working with the Credit Rating Agencies

GlobalAgRisk has also been meeting with the credit rating agencies in Peru — private-sector entities that rate the financial institutions. Their ratings determine the interest rates at which financial institutions can borrow. This may become increasingly important as some cajas are interested in issuing bonds as a relatively inexpensive way to obtain capital.

Credit rating agencies are interested in many of the same aspects of bank business as the regulator, yet with a different emphasis. While the priority of the regulator is to maintain bank solvency, the priority for credit ratings agencies is to create a clear signal for counterparties (other banks, firms, individuals, etc.). These counterparties lend to the bank under specific terms and credit rating institutions help them evaluate the risk of that transaction. As a result, credit rating agencies tend to highlight stability in terms of

1. Profits;
2. Asset quality;
3. Liquidity;
4. Asset-liability management (matching the maturity of assets and liabilities on the balance sheet); and
5. Capital (more inclusive than liquidity as it includes illiquid and semi-liquid forms of capital, PCR, 2009).

Indicators such as profits, liquidity, and asset-liability management are important for determining the ability of a financial institution to service its debt regularly. Asset quality is especially important for indicating the likely future health of the institution, which is important for longer-term investors.

Given the goals of credit rating agencies, we believe ENSO Insurance has potential to improve the performance of the cajas. One of the key characteristics of insurance is it smoothes profits through time — that is, insureds pay premiums in good years and receive indemnities in bad years. We have also described the benefits of ENSO Insurance in terms of smoothing liquidity and improving bank performance after a severe El Niño. Our discussions with the credit rating agencies have led us to conclude that it may be insufficient for a caja simply to purchase the insurance to improve its credit rating. Rather, it seems important that a caja is able to develop a risk management plan that demonstrates the ability of the insurance to reduce the risk exposure of the caja.

In the months ahead, we intend to work with the credit rating agencies to more concretely demonstrate what benefits ENSO Insurance might have in terms of the variables of interest to these ratings agencies. More specifically, we want to estimate what level of insurance is needed and how the cajas could formulate a risk management plan to reduce their risk in an optimal way given the other risk management strategies they employ.

While GlobalAgRisk is working within a specific context to increase incentives for cajas to manage their risk through ENSO Insurance, it is important to note that we share a common goal with the SBS and the credit rating agencies: improve the risk management of the cajas. While working with the cajas, we have emphasized that the SBS and the credit rating agencies are interested in ENSO Insurance precisely because it may improve the cajas' ability to manage their risk exposure.

3.6 Work with the Agricultural Value Chain

GlobalAgRisk also works with several groups in the agricultural value chain including farmer associations and commodity exporters. The work with farmer associations begins with discussing the previous experience of these farmers and their communities during the severe El Niño events of 1983 and 1998. Some of these groups report that washed out bridges and roads isolated communities for up to six months and that sedentary water increased pest and disease problems including malaria. The association members then discuss their expectations regarding their current exposure to El Niño. Finally, the farmer associations consider how, if they purchased ENSO Insurance, they would use any indemnities received. In some cases, these groups discuss important community-level actions such as cleaning drainage systems; in other cases, they mention establishing a procedure for passing indemnities on to those most severely affected.

Commodity exporters are exposed to through-put risk due to El Niño. Their revenues can suffer when local production volumes decline and when the quality of the commodity is reduced. Exporters report that El Niño can create volume and quality problems. One exporter reports wanting to use ENSO Insurance indemnities to cover its fixed costs, including maintaining its staff. The exporter plans to use its staff to improve conditions that would allow for a quick recovery in export volume, for example, staff could help improve roads by adding large rocks so the exporter's trucks can access some of the isolated farmers.

Input suppliers are also at risk from El Niño. Those that provide credit to farmers are exposed to loan default risk similar to that of the cajas. During an El Niño event, input suppliers also face reduced demand for their products. For example, 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.

3.7 Marketing, Sales, and Next Steps in Peru

As indicated earlier, the insurance marketing and sales season for ENSO Insurance effectively began in December, 2009. The sales closing date is March 31, 2010. The end of the education phase and the start of the marketing phase represent a transition in which the collaborating insurance company, La Positiva, became the leading conductor of ground-level activity in Piura. To facilitate this transition, GlobalAgRisk gave interviews along with representatives of La Positiva at press conferences in Lima and Piura. La Positiva reports that as a result they received a large number of inquiries from a variety of firms operating in Piura and other regions exposed to extreme El Niño.

3.8 Conclusions

The development of the ENSO Insurance product in Peru has demonstrated several important points. First, the national banking and insurance regulator (the SBS) has been consulted throughout the product development process. In early discussions the SBS made it clear that any ENSO-based product should be structured as insurance rather than as a financial derivative. Subsequent discussions focused on the requirements for ENSO Insurance to qualify as a business interruption valued policy. The SBS also agreed to the concept of basing indemnities on November and December sea surface temperatures as a forecast of flood losses that would occur in February–April period. To our knowledge, this is the first “forecast index insurance” product to receive regulatory approval. In sum, the involvement of the national regulator is critical to the development of this innovative insurance product and increases the potential that a sustainable product has been developed.

Second, this project may increase awareness and lead to new thinking and opportunities regarding the potential for “forecast index insurance” — in particular with regard to oceanic oscillations such as ENSO. El Niño events affect many regions of the world. The most dramatic effects are likely in Peru and Ecuador; however, El Niño affects other countries in South, Central, and North America as well as Southeast Asia and East Africa. In some regions, El Niño is associated with flood and in others with drought. Thus, while no other region may have as strong a correlation between ENSO measures and flooding as northern Peru and southern Ecuador, ENSO-based insurance may provide risk management benefits in other regions as well. In addition, further research is needed to determine whether other oceanic oscillation measures could provide useful underlying indexes for insurance products.

Third, initially targeting ENSO Insurance to risk aggregators has proven to be highly valuable. This has facilitated an immense amount of learning about how natural disasters affect MFIs and other banks and stimulated research efforts focused on how insurance can potentially provide risk management benefits within the context of globally-recognized banking standards. If successful, these efforts could improve access to credit for regions that are highly exposed to natural disasters. Also, while at this stage ENSO Insurance is not being made available directly to smallholder households, the product could, in principle, be sold to households either as a stand-alone insurance product or in combination with other financial services.

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Case Study 4
The Index-based Livestock Insurance (IBLI) Program in Mongolia

Jerry Skees, Barry Barnett, and Anne G. Murphy

The Index-based Livestock Insurance (IBLI) program in Mongolia emerged in response to multiple years of severe livestock losses that occurred in the winter and spring seasons of 2000–2002. The loss of a third of all livestock, and the impact that had on herding households and the larger economy, provided the impetus for the government of Mongolia (GoM) to look for a new approach to managing livestock risk. At that time, no insurance products were available to adequately protect herding households from losses of such magnitude. The state livestock insurance program had been unsuccessful in the transition economy during the 1990s and the large losses that occurred in the 2000–2002 period put an end to what remained of the commercial livestock insurance market in Mongolia.

Mongolia is a large, sparsely populated country with a long tradition of nomadic livestock herding. Though the livestock sector experiences transformations over time, it continues to be an important part of the economy, contributing 25 percent of GDP and providing a primary source of income, subsistence, and wealth to more than 170,000 households (Mongolia, 2007). The importance of livestock to the livelihoods of rural households increased with the shift from collectivized farming during the socialist period to family-based herding during the 1990s. During the transition to a market economy, many households unable to find work in the city moved to the countryside to take up herding. From 1990 to 1997, the number of households engaged in herding doubled and the overall livestock population grew from 25 million to 31 million. Weather conditions were relatively benign during this period; however from 2000 to 2002, extreme weather conditions created successive *dzud* — extreme conditions that can include bitterly cold temperatures, wind, and snow or ice that prevents livestock from foraging. These events occurred during a time when the increase in herding households, including many novice herders, was placing increased pressure on the natural resource base. At precisely the same time, state-supported risk mitigation systems (forage and groundwater wells) broke down as they depended heavily on subsidies from the Soviet Union.

The losses from 2000 to 2002 were widespread and adversely affected many rural households as well as the broader economy. More than 11 million adult animals died in Mongolia due to harsh winter conditions. Over 48 percent of the cattle and yak died in these three years, and more than 10,000 herder families lost all of their animals. Following these losses, rural poverty rates increased leaving households even more vulnerable to the impact of future dzud.

4.1 Searching for a New Approach

The GoM had historically reacted to widespread livestock mortality by providing *ex post* disaster assistance and investing in restocking. However, for the 2000–2002 losses, the costs were such that restocking was not financially viable, and there were concerns that an expectation of *ex post* assistance could create perverse behavioral incentives for herders. Since 1995, the GoM made several attempts to develop a livestock insurance law that would establish a mandatory national livestock insurance program, but without success. At the time of the 2000–2002 events, a small private-sector livestock insurance market provided coverage was not mandatory and participation rates were very low. As the livestock losses began to grow, the insurance companies did not have the financing to cover such large losses and failed to honor the policies and did not pay the full indemnities due to herders who had experienced losses. The total value of animals lost from 2000–2002 exceeded USD 200 million. Without external sources of contingent capital, financing losses of this magnitude was simply not feasible.

There are several reasons why a traditional pooling approach to insurance did not work for livestock risk in Mongolia:

- Insurance companies in Mongolia are small, have very limited financial capacity, and little access to the financial resources of global reinsurance markets. The financial exposure from covariate livestock mortality risk was simply too large for any insurance company to manage without access to external risk financing;
- The vast geographic area of Mongolia and the nomadic nature of herders greatly increase the transaction costs associated with administering a traditional insurance program. Among the more basic problems are reaching herders, verifying the number and condition of the animals to be insured, and assessing the number of animals (and their value) lost by an individual herder during a dzud event;
- Due to very high transaction costs, it was impossible for insurers to adequately classify the risk exposure of potential insureds and charge appropriate risk-adjusted premium rates. This led to adverse selection problems; and
- Due to very high transaction costs, it was not possible to monitor the actions of insured herders. This created moral hazard problems that reduced incentives for herders to care for their animals during dzud events.

While many in Mongolia advocated mandatory livestock insurance, such an approach fails to address any of the problems outlined above. In the aftermath of the events of 2000–2002, discussions of the need for a national livestock insurance program reemerged and the GoM began searching for a new approach to manage livestock mortality risk — an approach that could protect rural livelihoods against severe livestock losses and complement a broader risk management framework. At that time, the World Bank in Mongolia was engaged in their Sustainable Livelihoods Program, emphasizing pastoral risk management in Mongolia. The program included improved early warning systems and risk preparedness actions, access to supplementary feed and grazing reserves, coordination of pasture-land use, and conflict management. These measures were combined with efforts to extend the outreach of microfinance services to herders, and community-prioritized investments in basic infrastructure. As a component of this program, the GoM asked the World Bank to investigate new strategies for livestock insurance.

Preliminary feasibility work in 2001 introduced the concept of an index-based livestock insurance that would pay indemnities based on the mortality rate of each species at the *soum* (county) level, using livestock data collected by Mongolia's National Statistics Office (NSO). The GoM has been conducting an annual census of animals in mid-December for nearly 90 years, since 1961. Using these December census data as the base for adult animals makes it possible to calculate the mortality rate by species and soum.

Under this model, indemnity payments would be made when the species-specific aggregate mortality rate in the soum exceeds a certain threshold level. Insured herders would be paid according to the aggregate mortality rate of the soum rather than their individual losses. This eliminates moral hazard and adverse selection problems, and eliminates the cost of having to conduct a loss assessment for each insured herder.

The GoM requested additional research into the potential for index-based livestock insurance and the World Bank provided support for further feasibility work in 2003 as part of the risk management component of the Sustainable Livelihoods Program. The feasibility work considered three alternative insurance models in an attempt to identify the most suitable design for the Mongolian context: 1) traditional individual herder “assessed loss” livestock insurance; 2) weather-based index insurance; and 3) mortality-based index insurance. Traditional individual herder livestock insurance, wherein payments are made on the basis of individually assessed livestock losses, was soon deemed infeasible due to moral hazard, adverse selection, high transaction costs, and a largely immature private insurance market. As indicated earlier, such products had previously been unsuccessful in Mongolia.

In looking for alternative approaches, both weather data and livestock data were examined to determine the most suitable livestock insurance index for the Mongolian context. Weather index insurance has been applied in other countries where traditional insurance approaches are not feasible. However, it was quickly determined that weather insurance would not be feasible in Mongolia, mainly because of dzud. Conditions that create dzud and lead to high livestock mortality cannot be attributed to a single weather condition or a consistent sequence of events. Dzud can result from a complex and dynamic interaction of weather conditions that can be different with each occurrence. In some cases, large losses occur suddenly from a fast-moving storm. In other cases, large losses can accumulate throughout the winter and spring season. An examination of available weather data showed no strong correlation of specific weather variables to livestock mortality. The quantity and quality of available weather data were also determined to be inadequate to support weather index insurance. For these reasons, an index product based on mortality was determined to be the most viable livestock insurance alternative for Mongolia.

The main priority in designing the new livestock insurance program was to protect herder livelihoods against the type of catastrophic losses that occurred in 2000–2002. Severe and widespread losses, though less frequent, have the most devastating consequences on herding households and the rural economy. Herders can withstand smaller losses, but it becomes extremely difficult to recover from high livestock mortality, especially when losses are experienced across an entire soum and traditional coping strategies break down. At the same time, it was important that the livestock insurance program complement, rather than interfere with, other types of risk management strategies. A mortality-based index insurance program would achieve this as indemnities would be paid based on the mortality rate in the soum and not on the actual livestock losses experienced by the insured herder. Thus, the incentive remains for each insured herder to try and save as many animals as possible.

4.2 The IBLI Pilot Program

In 2004, the GoM expressed their support for the World Bank to pilot the IBLI concept and test its viability in Mongolia. At that same time a new general insurance law was being drafted, policymakers were presented with the proposal for the IBLI pilot program and were generally supportive of the concept. They structured the new insurance law to accommodate the inclusion of index insurance, which enabled the pilot program to emerge within the legal framework.

While it would have been possible to calculate mortality rates on an annual basis using data from the December NSO census, this would have meant that herders would not be paid an indemnity until a full year after the time when most losses would occur. Thus, the IBLI program worked with the NSO to implement a mid-year survey of livestock so that indemnities could be paid sooner.

The first sales season began in March, 2006, in three *aimags* (provinces): Bayankhongor, Khentii, and Uvs. Since then, the IBLI program has been expanded to other aimags with plans to offer IBLI in all 21 aimags within the next few years. For the 2010 sales season, IBLI will be sold in nine aimags and cover the five major livestock species: cattle/yak, sheep, goats, horses, and camels. A Project Implementation Unit (PIU) was established at the start of the pilot to coordinate and manage the components and activities of the pilot, which include educational outreach, capacity building, managing the financing and processing of payments, and maintaining data systems.

IBLI is sold directly to herders through insurance agents in the countryside. Currently four insurance companies are participating. The sales season runs from spring to mid-summer to cover losses that occur from January through June of the following year. The sales season must close early enough to prevent herders from adversely selecting on the insurance. If sales extended into late summer, herders would know more about pasture conditions and the health of the animals going into the fall and winter. Thus, they could choose to buy only when the likelihood of a loss increased.

Herders select their sum insured based on a percentage of the total value of the livestock they own by species, up to 100 percent. There is no minimum sum insured, and most herders choose to insure about 30 percent of the value of their herd. Indemnities are paid by early August after the estimates of soum-level livestock mortality for each species are calculated from the mid-year livestock sample survey conducted in June. For a given year *t*, the species-specific mortality rate in each soum is calculated as

$$\mathit{Mortality\ Rate}_t = \frac{\mathit{Deaths\ January\ to\ May}_t}{\mathit{December\ Census\ Count}_{t-1}}$$

where the subscripts refer to the year.

The IBLI pilot program consists of a public-private partnership that combines a commercial insurance product (the Base Insurance Product, or BIP) with catastrophic coverage from the GoM (the Government Catastrophe Cover, or GCC). Herders self-insure the smaller losses less likely to affect the long-run viability of their business, while large losses are transferred to the private insurance industry and catastrophic losses are transferred to the government. Specifically, no indemnities are paid until mortality rates for the species in the soum exceed 6 percent. The BIP begins paying indemnities when mortality rates exceed 6 percent up to a limit of 30 percent. The BIP indemnity function is

$$\mathit{Indemnity} = \mathit{Payout\ Rate} \times \mathit{Sum\ Insured}$$

where

$$\textit{Payout Rate} = \min\left[30\% - 6\%, \max\left[\textit{Mortality Rate} - 6\%, 0\right]\right]$$

The GCC pays indemnities for the catastrophic layer of risk from 30–100 percent mortality and is financed solely by the GoM. When herders purchase the BIP, the GCC is automatically included, and sold as a single product. However the financing for the two products is completely separate. The GCC is strictly a subsidy from the GoM. It is not financed by BIP premiums collected from herders. In the case of extreme losses, the GoM can access a World Bank contingent loan to help finance GCC payments.

Separating the financing of the BIP and GCC has significant advantages in lowering the cost of the BIP and in providing proper incentives for insurance companies to pool the risk. Insurance companies retain the risk for the BIP and premium rates are based only on the risk of the 6-30 percent mortality layer. The government coverage for extreme losses addresses a level of risk that is typically subject to cognitive failure. Catastrophic risks typically fall outside the scope of households' planning and risk management strategies. However, catastrophic risks create the biggest problems for households and the government coverage of losses above 30 percent can have important, positive social benefits.

4.3 Risk Financing Structure

The IBLI program was designed with the primary goals of creating a sustainable and affordable insurance product that would protect herders' livelihoods against severe livestock losses. However, to achieve these goals, the IBLI program also had to be structured to account for the challenges of insuring a catastrophic risk and weaknesses within the existing insurance market.

The IBLI project gave special consideration to organizing the financing so that all indemnities are paid in full when there is a catastrophic loss. The BIP has a unique risk pooling arrangement that is designed to fully secure indemnity payments and to protect the mutual interest of all stakeholders. It is possible for a single year of extreme livestock mortality across Mongolia to result in BIP indemnity payments that exceed premium by three or four times. The current financing arrangement follows best practices by structuring layers of risk financing. Insurance companies retain some portion of the risk. This retained portion is pooled with other companies. Reinsurance premiums are also paid into a BIP reserve fund controlled by the GoM as a mechanism to pay for GOM reinsurance. If the reserve fund is exhausted, the GoM also has access to contingent credit from the World Bank to pay BIP indemnities.

4.4 The Livestock Insurance Indemnity Pool (LIIP)

The Livestock Insurance Indemnity Pool (LIIP) is the foundation of the risk financing structure for the BIP product. The LIIP is a risk sharing arrangement through which insurance companies pool their risk exposure and pay all indemnities on BIP policies.

Financing for the LIIP comes from several sources. First, the premium paid by the insured for each BIP policy consists of two components: the risk-loaded premium (RLP) and an administrative load. The company that sells the policy keeps the administrative load and deposits the RLP into the LIIP.

Second, participating insurance companies are required to commit some of their own capital by depositing an IBLI participation fee (IPF) into the LIIP. For the 2010–2011 insurance cycle, each insurance company pays Mongolian Tugrik[13] (MNT) 30 million (about USD 21,000) towards their IPF prior to the start of the sales season. After sales closing, the required IPF is calculated for each company based on the RLP that the company has generated during the sales season and adjustments are made to the initial MNT 30 million payment. The final amount of IPF must match the net position of any stop loss that is offered on the LIIP plus replacement of all reinsurance premiums. This ensures there are sufficient funds in the LIIP to pay all BIP indemnities up to the LIIP stop loss level. Thus, if the LIIP stop loss is 110 percent, the IPF would be 10 percent times RLP plus the replacement cost of assessments paid to the BIP reserve fund and reinsurance premiums paid for any global reinsurance. When the BIP reserve fund assessment and global reinsurance are both quoted as a percent of RLP, the IPF calculation is:

IPF = (LIIP Stop Loss – 100) + (BIP Reserve Fund Assessment + Global Reinsurance Cost)

Suppose that the LIIP stop loss is 125, the BIP reserve fund assessment is 40 percent of RLP, and global reinsurance is not purchased.[14] Then the IPF = (125-100) + (40+0) = 65 percent of RLP. The LIIP is able to pay indemnities up to 125 percent of the RLP. Other sources of financing are required to pay for indemnities in excess of 125 percent of the RLP. Forty percent of the RLP is paid into the BIP reserve fund. This leaves 60 percent of RLP to finance potential indemnities. The IPF (equal to 65 percent of RLP) paid by the insurance companies represents their capital at risk for paying potential indemnities.

As another example, suppose that participating companies wish to reduce their capital at risk in the LIIP account so they agree to set the LIIP stop loss at 60. Contingent capital is obtained by purchasing global reinsurance that pays for a layer of indemnities between 60 and 125 percent of RLP. Suppose that the cost of the global reinsurance is 10 percent of RLP and the LIIP still must pay 40 percent of RLP into the BIP reserve fund. In this case the IPF = (60-100) + (40+10) = 10 percent of RLP. Forty percent of the RLP is paid into the BIP reserve fund and 10 percent is used to purchase global reinsurance. This leaves 50 percent of RLP to finance potential indemnities. By purchasing the global reinsurance, the companies' capital at risk has been reduced to only 10 percent of RLP.

A graphic depiction of these two scenarios appears in Figure 5. Without the global reinsurer, the IPF is equal to 65 percentage points times the RLP and all of this value represents the insurance company's capital at risk. With a global reinsurer covering a layer of indemnities from 60 to 125 percent of RLP, IPF declines to 10 percentage points. However, the retained premium is also lowered as the RLP is used to pay the additional reinsurance cost of 10 percent from the global reinsurer.

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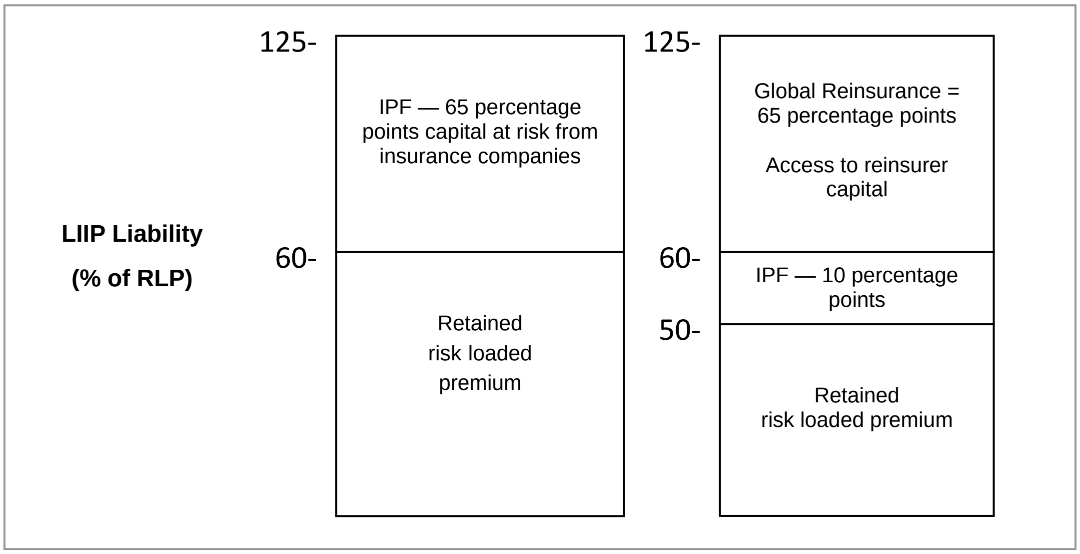
[13] As of March 8, 2010, USD 1 equals MNT 1,420.A

[14] The GoM reserve fund pays for aggregate BIP indemnities in excess of 125 percent of RLP for each aimag (see the next section of this appendix). For this reason a LIIP stop loss of 125 percent of RLP is used here to simplify the example. However, to date, no global reinsurance has actually been obtained and the actual LIIP stop loss has been 105 percent of RLP. This creates a potential financing gap between the LIIP stop loss and when the GoM BIP reserve fund starts covering indemnities. This financing gap has also been covered by the GoM BIP reserve fund. A goal of the project is to eliminate this financing gap by obtaining global reinsurance and increasing the LIIP stop loss to 125 percent of RLP.

Figure 5 Insurers' Capital at Risk under Different Financing Arrangements



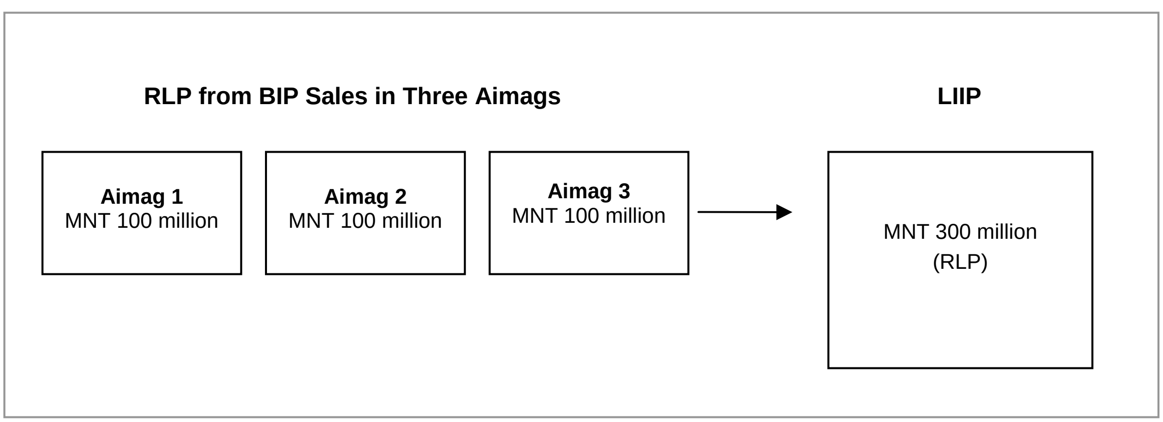
Source: Authors

In either of these scenarios, the LIIP has secured financing that is sufficient to pay indemnities up to 125 percent of the RLP. Indemnities in excess of 125 percent of the RLP are paid using the third and fourth sources of BIP financing, the GoM reinsurance. These are the BIP reserve fund and World Bank contingent credit.

4.5 Other BIP Financing

The GoM uses the BIP reserve fund to pay indemnities that exceed 125 percent of RLP aggregated across all insured species in the aimag (province). Consider a simple case of three aimags, each having a total RLP of MNT 100 million (Figure 6). The total amount of RLP that would initially go into the LIIP account would be MNT 300 million.

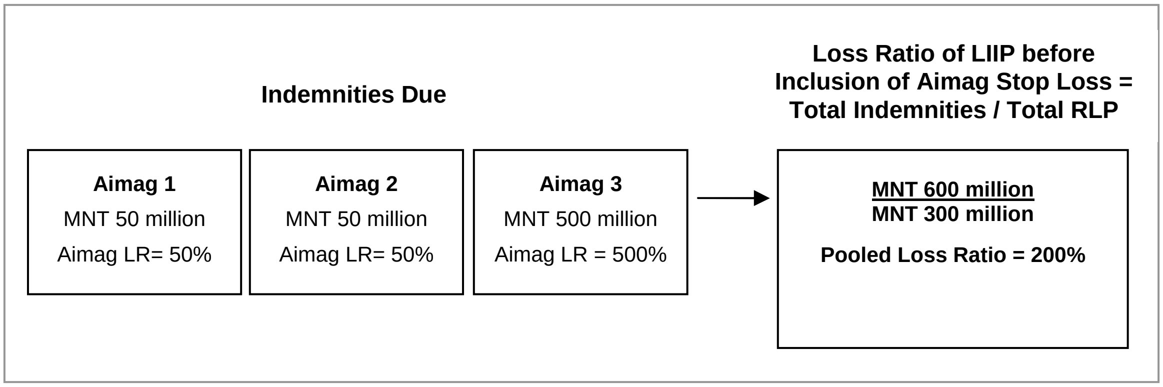
Figure 6 Example of Total RLP of Three Aimags and the LIIP Account



Source: Authors

In the example presented in Figure 7, if one aimag has indemnities that total MNT 500 million and the other two aimags have indemnities of MNT 50 million each, the total indemnity payments due would be MNT 600 million from MNT 300 million of RLP (i.e., a national loss ratio of 200 percent).

Figure 7 Example of LIIP Loss Ratio without Aimag Stop Loss



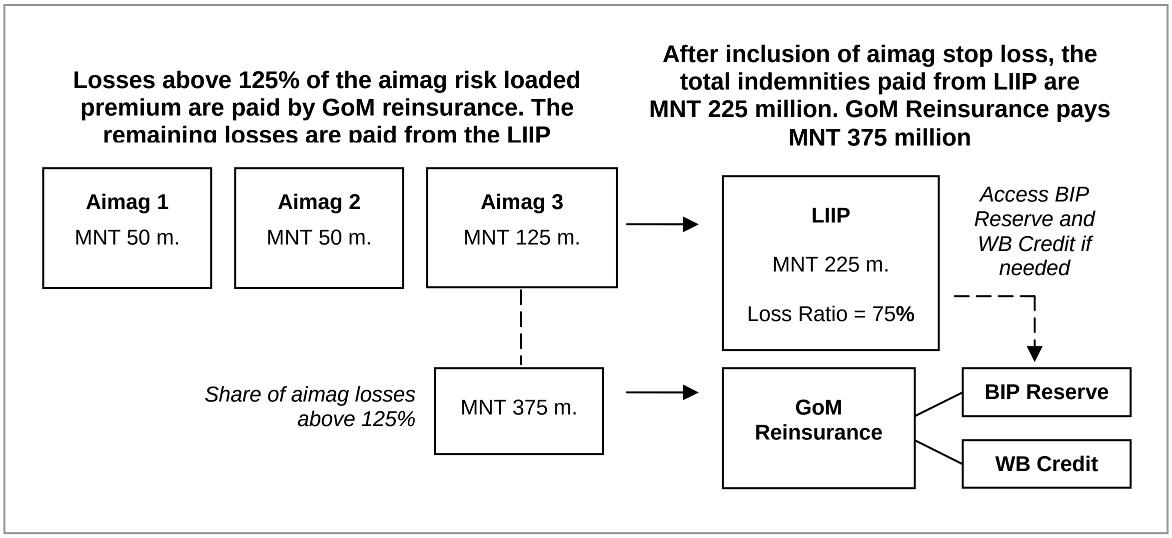
Source: Authors

With the aimag stop loss, the GoM pays from the BIP reserve fund any indemnities exceeding 125 percent of the aggregate RLP of any aimag. In the aimag with the 500 percent loss ratio, the reserve fund would pay for indemnities in excess of MNT 125 million (125 percent of the MNT 100 million RLP). So the BIP reserve fund would pay for MNT 375 million (MNT 50 –MNT 125) of indemnities in that aimag. The LIIP account pays the MNT 225 million (125+50+50=225) of indemnities due after the reserve fund has paid for all aimag indemnities in excess of 125 percent. Thus, the residual loss ratio for the LIIP account is 75 percent (225/300).

At the end of the insurance cycle, after all indemnities have been paid and the accounts have been settled, any surplus in the LIIP account is distributed among the participating insurance companies based upon their premium volume brought to the pool. In the event that the BIP reserve fund is exhausted, the World Bank contingent credit is used to pay any remaining indemnities due (Figure 8).[15]

[15] The RLP and IPF funds paid into the LIPP account earn interest. This interest is *not* used to finance indemnities. Instead, at the end of the insurance cycle, the interest is distributed among the insurance companies based on their percentage contributions to the RLP.

Figure 8 Example of Loss Ratio and Indemnity Payments with Inclusion of Aimag Stop Loss



Source: Authors

4.6 Motivation for the LIIP

The LIIP unique financing structure creates risk sharing across insurance companies and also ensures that premiums are secure until all indemnities have been paid and the insurance cycle has been completed. Many pooling arrangements are plagued by lack of trust and high transaction costs. These problems occur because each insurance company is concerned about the risk underwriting performed by all the other insurance companies who are participating in the collective pool. However, these problems are not present with the LIIP because all participating insurance companies are selling the same insurance contracts. For a given species and soum, the RLP rate is the same for each company. The uniformity of the contracts and the risk pricing greatly reduces the transaction costs of participating in the pooling arrangement. This is an important aspect of pooling with an index insurance contract versus attempting to pool traditional insurance products that will undoubtedly be more heterogeneous.

The LIIP was designed with a number of objectives in mind:

- Ensure that herders receive the full indemnity payments that are due — no default risk;
- Provide a simple and stable structure for BIP implementation that allows for flexibility in the future;
- Provide incentives for companies to sell the BIP product;
- Ring-fence the BIP business from participating insurers' other insurance business;
- Insulate the insurance industry from the financial exposure of catastrophic livestock losses;
- Create a structure that is consistent with international regulatory and legal standards for financing catastrophic risk;
- Protect the government as reinsurer;
- Convince the Financial Regulatory Committee (FRC), the insurance regulator in Mongolia, that adequate financing is in place to support the BIP;

- Create a stable and secure financing structure that could eventually attract the participation of international reinsurers; and
- Provide transparency to build the confidence of all stakeholders.

The special arrangement of the LIIP clearly communicates to participating insurance companies that the herder premium from the BIP is a pre-paid indemnity and they have no claim on it until the settlement of indemnities. In order for the LIIP to provide adequate ring-fencing, the funds held within the LIIP are not considered property of the insurance companies, for example as a reserve. There is a transfer of ownership of the funds paid into the LIIP from the participating insurers to the GoM. If the funds in the LIIP could be construed as belonging to the insurers, there would be a risk that if a participating insurer were to enter into formal liquidation proceedings, the liquidator could make a claim to the funds. Of course, companies do own the right to interest earnings that accumulate on their share of the LIIP account.

4.7 Current Status and Future Challenges

The IBLI pilot has demonstrated there is a demand for index-based livestock insurance among herding households in Mongolia. Three insurance cycles have been completed to date (the fourth will end in August, 2010) and the premium volume and number of policies sold has increased each year. In the 2009 sales season, 4,315 BIP policies were sold in four aimags, representing approximately 12 percent participation. For 2009, the BIP premium totaled MNT 180 million (roughly USD 127,000).

Access to IBLI has also enabled some herders to receive discounted loans. Several banks offer reduced interest rate to herders who have purchased the insurance. While there are some existing regulatory concerns about allowing IBLI to be sold through a bank where it could be directly linked to a loan, the PIU worked with banks to develop a special loan for herders to finance a herder’s premium payment, helping seasonal cash flow problems common to agricultural livelihoods. However, in the future, linking IBLI to herder loans will be important for reducing the delivery costs and improving access to the product.

The planned expansion of the program to all aimags in the next few years will increase access to IBLI but it will also challenge the financing structure as the risk exposure increases. Major livestock losses occurred in 2007 and 2008 which triggered large indemnity payments and resulted in the insurance companies losing money two years in a row. The financing structure effectively ensured that all herders that were due a payment received the full amount. The risk financing structure and premium rates were reevaluated and adjusted in 2009 to reduce insurance companies’ exposure so as to maintain their participation in the face of what may be a third year of major losses in 2010.

Having global reinsurers take a layer of risk is the next step toward reducing the financial exposure of the insurance companies, thereby improving the sustainability of the BIP. Reinsuring exposure to catastrophic risk is essential for the expansion and long-term sustainability of any index insurance program and this is currently being pursued in conjunction with the planned expansion of the IBLI program. However, attracting the interest and participation of global reinsurers remains a challenge to the development of index insurance markets in lower income countries.

The lack of access to global reinsurance was accounted for from the start of the IBLI pilot with the design of the LIIP and layering the risk financing to limit the risk exposure of the insurance companies. The ultimate goal is that global reinsurance provides some of the risk financing needed for a national IBLI program. For a nationwide IBLI program, estimates of the maximum exposure of the BIP for a high-loss year like 2001 are USD 12–15 million — that is USD 10 million of exposure beyond the annual base premium of the BIP, assuming a 25 percent participation rate and with only 30 percent of the value insured. With full participation, the financial exposure of the BIP could exceed USD 100 million depending on the percent of value insured. Transferring this risk to larger capital markets by reinsuring the risk exposure of the IBLI portfolio in global reinsurance markets is needed so the risk can be absorbed as part of a globally diversified portfolio.

In the future, as donor support is phased out, the financing provided by the contingent credit will need to be replaced. The GoM will either have to use reinsurance, use their own funds, or a combination of the two sources to pay for these losses. Transitioning portions of the risk to global reinsurance markets will be important, and potentially critical, as it is unlikely that the GoM will have the budget to finance the most extreme losses.

Reducing transaction costs of selling IBLI will be increasingly important in the transition to a national program. Currently IBLI is sold directly to herders only via certified insurance agents. However, the agent model is an inefficient delivery system in Mongolia. Agents must cover a great deal of territory to reach herders and the revenue generated from small transactions is not always sufficient to cover the expenses incurred travelling to herders to make a sale. Additionally, herders who are interested in purchasing the insurance are not always able to find an agent. The upper limit on the administrative load on the BIP has been increased during the pilot to help insurance companies cover the costs, but providing an alternative model of delivery would help reduce transaction costs and improve herders' access to finance. Enabling alternative delivery channels to reduce transaction costs of IBLI in Mongolia is critical for the sustainability of the program.

Selling IBLI through rural bank branches is one alternative under consideration. Herders would be able to purchase IBLI directly from a bank branch at a soum or aimag center. This would provide greater, more reliable access for the herder and significantly reduce the costs involved in making a sale. The reduction in administrative costs should result in a lower premium for the herder as well. Offering a bundled product with a formal linkage between IBLI policies and credit would provide even greater benefits through improved access to finance, and overcoming seasonal cash flow constraints of herders who wish to buy IBLI. However, the project team has identified constraints in the existing legal and regulatory framework that raise serious concerns about using banks as a delivery channel to sell IBLI or to offer a bundled product.

To mitigate conflicts of interest and opportunities for market misconduct, the preferred approach would be to have the banks act as agents. The Insurance Intermediaries Law does not prohibit a bank as a legal person from being licensed as an insurance agent. However, the current regulation in Mongolia specifies that only an individual may be licensed as an insurance agent, i.e., as an institution the bank cannot become an agent. As a product delivery issue, the main concern is the ability to provide proper oversight for the sale of IBLI by bank employees. If the bank is the agent, there is greater accountability for upholding proper market conduct. An employee of the bank would be fully subject to the bank's procedures and policies for the sale of IBLI. If the bank is the agent, the FRC and PIU would need to regulate and supervise the market conduct of participating banks, but not the loan officers. Under this scenario, a bank employee that engages in misconduct in the sale IBLI puts the bank's license at risk — a strong incentive for the bank to supervise its employees. If the loan officers sell IBLI as independent insurance agents, the FRC and the PIU would have to regulate and supervise them on an individual basis. This would be an impossible position for the FRC and PIU, and the participating banks. Amidst these concerns, some insurance companies have appointed loan officers as IBLI agents to provide a second delivery channel for IBLI.

The concerns about market conduct risk are exacerbated for a bundled product since the loan officer has greater leverage by controlling access to the loan and has the incentive to maximize their commission on both the loan and the insurance. The bank could exploit its stronger bargaining position to require the herder to purchase an IBLI policy that he does not want or to purchase a different level of insurance coverage than he needs.

The PIU and the project team continue to work with the FRC and the banks to discuss how to mitigate the market risk associated with the existing regulation governing insurance intermediaries, but these issues remain a constraint to market development of the IBLI product.

As the program expands and transforms to a national program, the core principles of the program embodied by the risk layering and the financing structure will help to maintain the integrity and sustainability of the program. The IBLI program is designed to foster market development and to create a public–private partnership that avoids many of the incentive problems often faced by government efforts to support agricultural insurance. The structure of the IBLI program has proven effective as a mechanism for insuring catastrophic risk exposure and ensuring secure financing of indemnities. The financing and regulatory structure of the project can have wide application with other index insurance products. It is carefully constructed to pool risk among insurance companies. The structure is designed to strengthen trust among herders, participating insurance companies, the government, and the global reinsurance market.

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