Scaling Up Index Insurance

What is needed for the next big step forward?

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December 2007

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Acronyms

AFMA	Australian Financial Markets Association
AICI	Agricultural Insurance Company of India
AMAP	Accelerated Microenterprise Advancement Project
ARD	Agriculture and Rural Development (World Bank)
AUD	Australian Dollar
BIP	Base Insurance Product
BASIX	An MFI in India
BIP	Base Insurance Product (Mongolia)
CAT (Bond)	Catastrophe Bond
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CME	Chicago Mercantile Exchange
CRMG	Commodity Risk Management Group (World Bank)
DRP	Disaster Response Product (Mongolia)
EAAE	European Association of Agricultural Economists
ENSO	El Niño-Southern Oscillation
EU	European Union
EUR	Euro
FAO	Food and Agriculture Organization
FCIP	Federal Crop Insurance Program (United States)
FONDEN	Fondo Nacional para Desastres Naturales (National Fund for Natural Disasters, Mexico)
FAPRCC	Fondo para Atender a la Población Rural Afectada por Contingencias Climatológicas (Fund for the Care of Rural Population Affected by Weather Contingencies, Mexico)
GBP	British Pound
GIRIF	Global Index Insurance/Reinsurance Facility
GoM	Government of Mongolia
GRIP	Group Risk Income Protection (United States)
GRP	Group Risk Plan (United States)
GFT	GIRIF Trust Fund
IAIS	International Association of Insurance Supervisors
IBLI	Index-based Livestock Insurance (Mongolia)
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
INR	Indian Rupees
IRI	International Research Institute for Climate and Society
ISDA	International Swaps and Derivatives Association

LIFFE	London International Financial Futures Exchange
LIIP	Livestock Insurance Indemnity Pool (Mongolia)
MAMDA	Mutuelle agricole Marocaine d'assurances (Morocco)
MFI	Microfinance Institution
mm	Millimeters
MNT	Tugrik; Mongolian currency
MPCI	Multiple Peril Crop Insurance
MRFC	Malawi Rural Finance Corporation
NASFAM	National Smallholder Farmers' Association of Malawi
NGO	Non-governmental Organization
NYSE	New York Stock Exchange
OIBM	Opportunity International Bank of Malawi
OTC	Over the Counter
PDF	Probability Distribution Function
PHRD	Japan Policy and Human Resources Development Fund
PPP	Public Private Partnership
RMA	Risk Management Agency (USDA)
SAR	Synthetic Aperture Radar
U.S.	United States
USD	United States Dollar
USDA	United States Department of Agriculture
WFP	World Food Programme
WMO	World Meteorological Organization
WRMA	Weather Risk Management Association
WRSI	Water Requirement Satisfaction Index

Introduction

Many of the world's rural poor depend on agriculture for their livelihoods (IFAD, 2006). Extreme weather conditions can threaten the recovery of poor agricultural households from the shock of a disaster and push the poorest of these households into a poverty trap from which they have no means of recovery. Besides the direct impacts, weather risk also has indirect impacts on the behavior of the rural poor, who generally engage in low-risk, low-return economic activities, costing all of society in lost opportunities (Barrett et al., 2007). Agriculture and development remain intricately linked in most of the developing world.

To try to stabilize the incomes of the rural poor, governments and development agencies have looked to crop insurance models of developed countries that compensate farmers for production losses. However, the models used in North America, Europe and Japan are not applicable or financially feasible for most developing countries due to high transaction costs and inefficiencies associated with trying to provide financial services to small unit households. Moral hazard, adverse selection and fraud are common in traditional crop insurance. Farm-level loss adjustment for many small farms as those that dominate in most developing countries is simply not practical. Consider the costs of loss adjusting parcels that are less than one hectare. Loss adjustment costs can easily be larger than the premium for the risks. Even in developed countries, the market for "traditional" agricultural insurance does not exist without government support except for a few specialty covers; thus, these markets are unlikely to emerge in developing countries where per-unit transaction costs are many times greater.

Nevertheless, developing countries remain vulnerable to weather risks that may increase as climate analysis indicates that both the frequency and severity of major weather events are on an upward trend. While it is quite clear that these risks impact the livelihoods of the rural poor, what is less well understood is that they also impact a country's economic growth and development. Without the ability to lessen the economic impact of these events and the behavioral responses to them, opportunities for growth and investment in the rural sector are often limited. To avoid or minimize exposure to weather risk:

- Agricultural households will choose low-risk, low-return activities; often meaning that new technologies are simply not adopted because of risks;
- Financial institutions may restrict lending to farm households for concerns about widespread defaults following a disaster; and
- Investment in the rural sector may be limited or withdrawn.

Even more troublesome are some of the risk coping strategies that are used by the poor to reduce their consumption expenditures following economic shocks:

- Withdrawal of children from school
- Distress sale of assets
- Reduction of nutrient intake
- Refugee migration
- Crime

These strategies may be effective at reducing risk exposure to some extent; however, the trade-off, or cost, is that opportunities for growth are hindered (Barrett et al., 2007).

The presence of weather risks limits the availability and accessibility of financial services by rural households. Their exposure to weather risk through their livelihood and limited assets for collateral makes them risky clientele from the point of view of a lender or insurance company. Yet development literature points to the absence of formal financial services as a major factor that locks people into poverty and slows economic growth in the rural sector (Barrett et al., 2007).

There are many factors contributing to the transaction costs of providing insurance to rural households in developing countries and overcoming transaction costs is the primary challenge in trying to develop financial markets for the rural poor in a developing country. Some of the factors that inhibit the development of agricultural insurance in developing countries include:

Traditional Agricultural Insurance Is Too Costly

- Correlated risks create large financial losses
- It is costly to control moral hazard and adverse selection
- It is expensive to deliver services to small-scale farms

Limited or No Experience in These Markets in Lower Income Countries

- Underdeveloped financial and insurance sectors
- Potential users are unfamiliar with formal risk transfer
- High start-up costs

Weak Institutional Structure

- Weak regulatory and legal environment
- Lack of contract enforcement
- Lack of access to international reinsurance markets

Index insurance is being tested in many developing countries in an attempt to address some of these constraints and develop new risk management models for lower income countries. Index insurance offers a way to introduce formal risk management markets that address some of the constraints to more traditional approaches.

In particular, index insurance can involve lower transactions costs since monitoring costs are greatly reduced and there no need for farm-level loss adjustment. Index insurance is best suited for correlated risks, severe, widespread events such as droughts and floods. These types of events are problematic for traditional insurance but can also be problematic for index-based approaches without external financing for large losses.

Beyond agriculture, index insurance can also be used to provide indemnities for disaster relief or to compensate other industries that can suffer from extreme variations in the weather. While index insurance can also be used for other objectively measured risks such as earthquakes, the focus of this paper is on weather risk as it has a broader relevance to agriculture and rural development.

Basics of Index Insurance

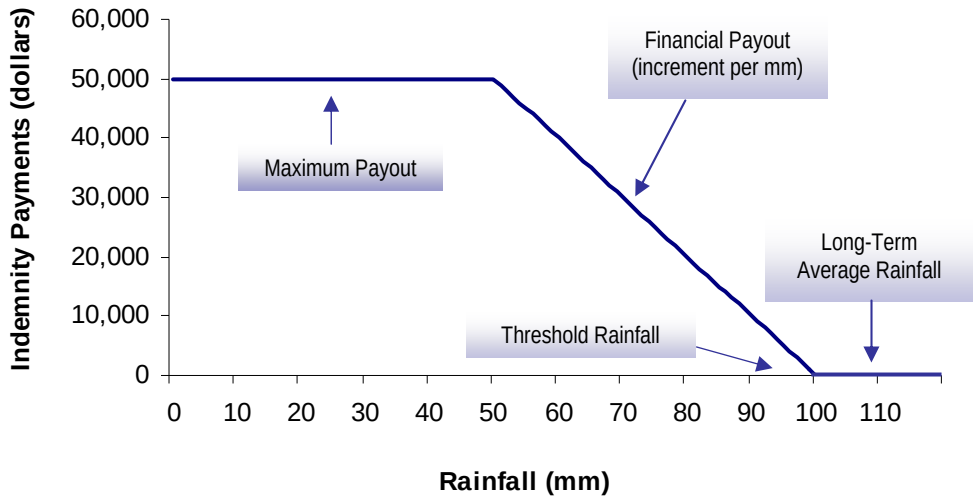
Index insurance differs from the traditional approaches to agricultural insurance in that loss estimates are based on an index, or proxy for loss rather than upon the individual loss of each policyholder. The index policy is designed to correlate the benefit with the actual value of the financial loss. For example, a rainfall index that uses measurements taken from secure weather stations is commonly used as an indicator of crop performance. Too little rainfall and too much rainfall can both result in poor production outcomes. Indexes can also be constructed from aggregate statistics such as area yields. Area-yield indexes are based upon aggregate crop output indicators such as county yields in the United States and district yields in India.

Index insurance has a defined threshold and a limit that establish the range of values over which indemnity payments can be made. The threshold marks the point at which payments begin. Once the threshold is reached, the payment increases incrementally as the value of

the index approaches the limit. For example, an index insurance contract designed to transfer the risk of drought would begin making indemnity payments if rainfall levels, as measured at an agreed weather station, fall below the threshold over a defined time period, such as a month or a season. Indemnity payments would increase proportionately for each millimeter (mm) of rainfall below the threshold until the agreed limit is reached. The maximum indemnity would be paid when rainfall is less than, or equal to, the limit. The payment rate for an index insurance contract is the same for each policyholder who has the same contract, regardless of the actual losses sustained by the policyholder. The amount of indemnity payment received will depend upon the amount of liability purchased (the value of the insurance). The indemnity payment is calculated by multiplying the calculated payment rate by the amount of liability the policyholder has (Skees et al., 2006).

Figure 1 shows a simple payout structure for a hypothetical index insurance contract for drought. In this illustration, the index is based on rainfall and below-average rainfall triggers payment. Assume the sum insured is USD 50,000 which is the maximum payout. Under this scheme, the threshold for payment is 100 mm of rainfall and the limit is 50 mm. When rainfall falls below 100 mm payments are triggered and made in equal increments for each deficit mm of rain until the limit, the exhaustion point is reached at 50 mm. If rainfall is less than 50 mm the maximum payment will be made. If rainfall is measured to be above 100 mm, no insurance payment will be made.

FIGURE 1: PAYOUT STRUCTURE FOR A RAINFALL INDEX INSURANCE CONTRACT FOR DROUGHT RISK



Source: Skees, 2003; Dick, 2006

Advantages of Index Insurance

To the extent that it is not possible to tamper with the measuring devices, index insurance overcomes the problem of moral hazard because the policyholder's behavior cannot impact whatever the index is measuring, such as rainfall. If the sales closing is set in a proper fashion, index insurance also overcomes adverse selection because both buyer and seller should have equal knowledge regarding the likelihood of the weather event that will trigger payments. Most importantly there are no loss adjustment costs. The amount of loss can be calculated using the coverage value and the index level, and the benefit can be deposited directly in the policyholder's account.

The features that make index insurance an alternative to traditional agricultural insurance in developing countries include:

- Addresses correlated weather risks

  - higher vulnerability to weather risk
  - large populations dependent on agriculture
  - high percentage of non-irrigated agriculture
  - severe weather can disrupt off-farm income and other rural services, e.g. transport, infrastructure
- Easier to administer
  - standard contracts
  - no individual loss-adjustment
- Lower transaction costs
  - reduced monitoring and administration costs
  - no individual loss adjustment

Disadvantages of Index Insurance

Index insurance may not be an appropriate tool in all circumstances and there are trade-offs to be considered. While an index should be closely correlated to actual losses, there will always be some variance between the index and individual losses. This potential mismatch is known as *basis risk*. Basis risk occurs when an insured experiences a loss but does not receive a payment because the index threshold value is not met, or conversely, when an insured receives a payment but localized conditions may not have resulted in a loss or as severe a loss as the index value indicates. Both examples demonstrate how realized losses do not always correlate strongly with the index.

Types of Basis Risk:

Spatial basis risk, the most common basis risk, is the difference in outcomes between the physical places where a loss event occurs and where the index is measured, e.g., it may rain at the weather station but the rain may not extend to a farmer a few kilometers away.

Temporal basis risk refers to the timing of the loss event considered, e.g., the consequences of lack of rainfall or excess rain may be worse depending on the stage of crop development. Contracts that target specific narrow crop cycles can display basis risk if the season starts sooner or later than typical. Many contracts, however, cover the majority of a growing season using a cumulative index, adjusting the relative importance of the index based on the various stages of plant growth during the season.

Loss specific basis risk occurs when the losses are poorly related to the index or there is an inappropriate use of a generic index. Traditional loss-adjusted crop insurance can also have embedded basis risk, e.g., when there are mistakes made in estimating base yields, and basis risk is a well understood component of hedging strategies that use agricultural commodity futures and options contracts. This is not to downplay the importance of basis risk in index insurance contracts—it should be clear that index contracts may simply not be appropriate for regions with microclimates or highly idiosyncratic risk. In these circumstances various risk pooling arrangements may provide better protection. However, traditional crop insurance models are also likely to perform poorly in such environments where asymmetric information problems will be strong and delivery costs high. Careful consideration of contract design and rigorous stakeholder education can mitigate the incidence of basis risk and help avoid undue expectations about the benefits and advantages of index insurance (Barrett et al., 2007).

The Structure of Index Insurance Contracts

When designing a product, it is crucial to minimize the basis risk by finding one or more indexes whose movements correspond as closely as possible to changes in the value at risk. This requires long-term, accurate data on both changes in the value at risk, e.g.,

changes in crop yields, and changes in the index, e.g., rainfall. Statistical analysis revealing the correlation between the index variable and losses is a starting point.

Building the product upon quality data is also important to the financial performance of the product. Accurate pricing is needed to ensure that sufficient financing will be available to cover the worse-case scenario. The extent of data required to develop a sustainable product is contested, though all agree that the longer the period of record the better. Afterwards, decisions can be made about length of the data record to use in developing and pricing the insurance. One reinsurer, PartnerRe New Solutions, presented a list of data requisites for developing an insurance product (Skees, Barnett, & Hartell, 2005).

- Prefer more than thirty years of weather data, especially to cover extreme risk
- Limited missing values and out of range values
- Prefer less than 1 percent of weather data missing
- Data integrity
- Availability of a nearby station for a verification
- Consistency of observation techniques: manual vs. automated
- Limited changes of instrumentation / orientation / configuration
- Reliable settlement mechanism
- Integrity of recording procedures
- Little potential for measurement tampering

Obtaining this information may be straightforward in developed countries but can be fairly difficult in many developing countries where weather data may not be archived in a useable format or the weather stations do not meet the standards of the World Metrological Organization (WMO). Nonetheless, weather data are generally collected using similar instruments and procedures in nearly every country of the world, making it possible to use weather data as a beginning point for developing agricultural insurance products.

In some efforts to minimize basis risk, complex crop growth models have been created to determine the most critical periods and rainfall requirements of certain crops. While much work goes into fitting these models, they may create a false sense of security that basis risk is not an issue. True growing conditions will vary from those used in plant growth simulation models; soils will nearly always be variable across small geographic areas and the input usage is likely to vary greatly from one farmer to the next.

An alternative approach is to move away from the notion of index insurance contracts for the smoothing of minor fluctuations in an individual's consumption and instead have the contract "deductible" set high enough, over a relatively homogenous area, to ensure that a large percentage of the insureds have at least some loss at the threshold index value. Such a contract structure starts to address the needs of truly catastrophic impact events and moves away from complex contract designs employed to avoid basis risk.

Especially in developing countries, catastrophic events are important obstacles to sustained household wealth accumulation and to the development and availability of financial services (Barrett et al., 2007). Poverty traps are frequently initiated as a consequence of a household's coping strategies to catastrophic events while financial service providers ration credit or even exit the market in areas where catastrophic events culminate in heavy loan default. Index insurance mechanisms are particularly effective in transferring this kind of spatially correlated blunt force risk and represent a logical starting point in financial services development efforts for the poor (Skees 2007; Barrett et al., 2007; Skees, Hartell, & Murphy, 2007).

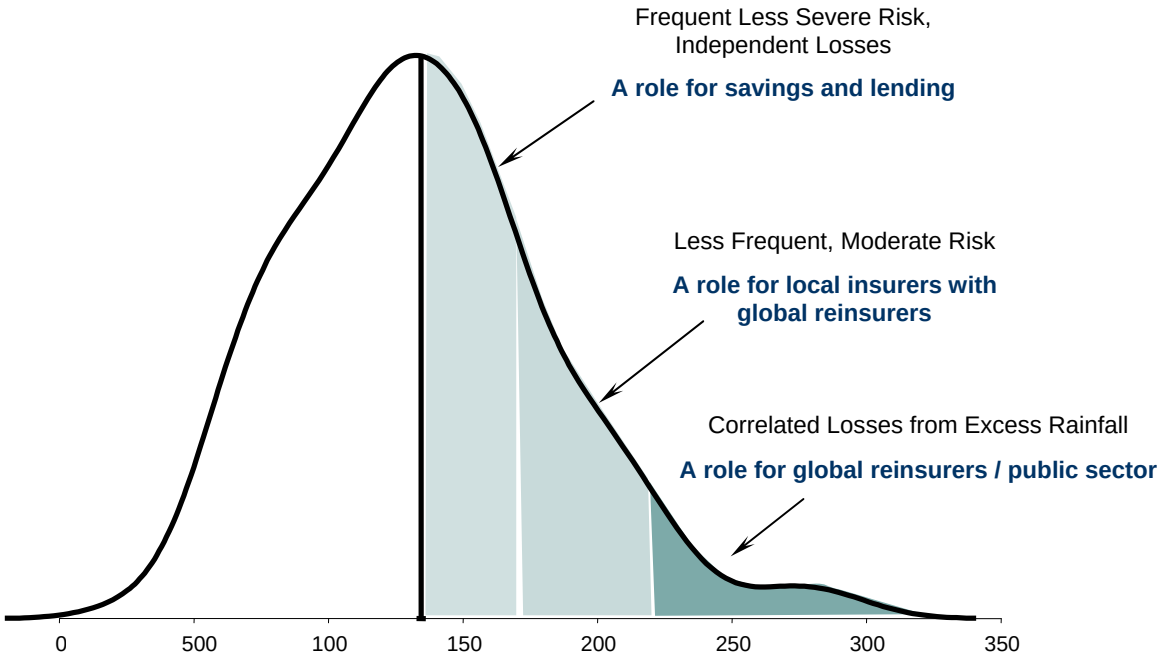
Any discussion of catastrophic risk coverage leads naturally to also considering the overall risk profile of producers in a region and how to segment or layer risk against which to apply different instruments that best match the characteristics of the risk. There is no single

formula for identifying where the segments occur but where the payment thresholds and limits are set depend on several factors of the risk analysis and market considerations.

First consider the layer of risk that is being targeted. Index insurance contracts typically have a finite range of values over which losses will be paid. The threshold and the limit mark the boundaries of payment which also limits the risk exposure of the insurance company. This range is often referred to as a layer of risk and the financing for each layer of risk can be dealt with using different structures. For example, the catastrophic layer of the most severe events may be covered through a social program as is the case in Mongolia, where losses above 30 percent are covered by a government program. (See the Mongolia case study). Figure 2 shows a sample probability distribution for rainfall and how layers of risk can be segmented for dealing with excess rain (flood risk).

Smaller variances from the mean can be self-insured, meaning the losses from events within this layer are not catastrophic, are likely to be less correlated, and can be dealt with through savings, credit, or informal means. The middle layer includes risks that are likely to occur less frequently but cause larger losses. This type of risk is better suited for insurance. Losses at the tail end of the distribution are often subject to cognitive failure and demand and supply for coverage at this level may be low, hence the market failure layer. This category of risks is characterized by natural disasters that cause widespread, catastrophic losses, and may include a public sector role in their financing.

FIGURE 2: LAYERING OF EXCESS RAINFALL RISK BY RAINFALL LEVELS

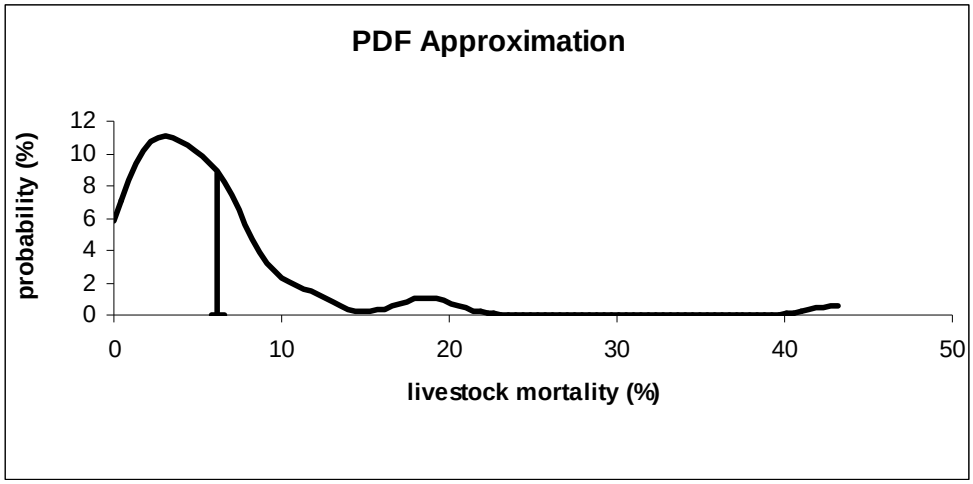


Source: Skees, Barnett, & Hartell, 2005

Figure 3 shows the probability distribution function (PDF) of aggregate livestock annual mortality for Bayankhongor *aimag* (province) in Mongolia. The Index-based Livestock Insurance (IBLI) scheme offers a Base Insurance Product (BIP) that pays for livestock losses using a *soum* (county)-level livestock mortality index. The two “bumps” in the distribution at 20 percent and 40 percent indicate the potential for severe livestock losses. The vertical line shows the mean mortality at just over 6 percent. This line also marks where the lower payment threshold begins. Another threshold option is offered at 10 percent mortality, though the mortality rates and payments are made for each species at the county level. At the 6 percent threshold, all losses to the right of the vertical line would be paid for through

the commercial insurance product (up to 30 percent). Losses beyond 30 percent are compensated for through a government-funded disaster product.

FIGURE 3: PDF OF AGGREGATE LIVESTOCK ANNUAL MORTALITY FOR BAYANKHONGOR AIMAG, MONGOLIA



Source: Authors, using data supplied by the National Statistics Office of Mongolia

By examining the distribution of data using historic data and risk analysis, the frequency and severity of events can be estimated. Pricing and financing considerations also come into play. Demand assessments of the target clientele reveal something about what people are able or willing to pay for specific types of insurance coverage. Using this information, the product can be structured around what is an affordable premium rate and how frequently a triggering event might occur. While there is no definitive premium rate that smallholders may find acceptable, premium rates in the 5 to 10 percent range are generally found to be acceptable. Thus, thresholds and limits on index insurance contracts can be selected in a manner whereby the fully loaded premium rates will fall within that range.

The Index Insurance Supply Chain

Generally, participants in the index insurance supply chain are not too different from participants in any other insurance product supply chain. Following are the basic roles of each in an index insurance scheme. The delivery model used will ultimately influence the supply chain.

Reinsurers

It is important to note that insurance instruments that cover against weather and natural disaster risk must be structured differently than traditional insurance products designed to transfer uncorrelated, independent risks such as automobile accidents, death, and disability (Table 1). Uncorrelated risks can be pooled locally within an insurance portfolio. In the case of correlated risks due to extreme weather or other natural disasters, domestic insurance companies must be able to sufficiently diversify this risk or transfer their risk exposure to a facility that can diversify, such as a global reinsurance company, in order to ensure adequate financing for the potentially large losses that can result from correlated risks (Skees, 2007).

By design, the risk covered by index insurance contracts is correlated. Unless the insurer is able to diversify sufficiently their risk and set aside ample reserves, the potential for a large number of simultaneous claims can cause insolvency. Self-financing this type of risk is extremely difficult due to the large losses than can occur from severe weather events. The risk must be transferred to a third party that can diversify the risk within their portfolio, such as a global reinsurer.

Table 1: Traditional Insurance versus Natural Disaster Insurance

	Traditional Insurance	Natural Disaster Insurance
Type of risk	Uncorrelated (car accident)	Correlated (drought)
Type of Loss	Individual	Community
Risk pooling	Local	Internationally

Source: Authors

The Insurer (The Primary Risk Carrier)

The primary risk carrier is the insurer. The insurer can be a (1) for-profit commercial insurer, (2) not-for-profit mutual insurer or (3) state insurer. For many index-based microinsurance schemes, no insurer can be found and governments take on this role.

The insurer typically plays three key roles:

- Designing and developing the product (though this is often outsourced to specialists)
- Carrying the risk
- Back office administration

With respect to back office operations, index insurance creates additional activities, such as monitoring the index (also often outsourced) and making payments when triggers are hit. Although extra work is created in the back office, the front office task of loss adjustment is eliminated.

Policyholders

There are three possible categories of policyholders:

Individuals and Groups of Individuals (Micro Level). Individual policyholders such as farmers, groups of farmers such as a cooperatives, or even development organizations such as the World Food Program (WFP);

Institutions (Meso Level). For example, an agricultural bank that lends to farmers and wishes to manage some of its exposure through weather insurance; and

Governments and Aid Agencies (Macro Level). Governments can purchase insurance to protect against catastrophic events that drain their fiscal resources. Aid agencies can purchase insurance to help finance their work in countries that have experienced catastrophes.

Delivery Models for Index Insurance

Issues of distribution are basically the same for index insurance as for other types of insurance. For microinsurance products, the need to lower transaction costs for serving low income markets makes distribution difficult. There are additional challenges to developing these products for low income markets which can add to the transaction costs such as education and marketing, reaching clients in remote areas, earning client trust, etc.

Depending on the end objective of the insurance, different delivery models can be used. The case studies below provide examples of the different applications at the micro, meso, and macro levels. The case studies also highlight some of the delivery models in which index insurance has been or can be applied. The target clients can range from individual households (micro level), businesses/intermediaries (meso level), or governments and international organizations (macro level).

Micro Level

Index insurance has been offered to individuals directly and linked to credit or the purchase of inputs, e.g., India, Malawi. Government or donors may also provide risk financing in place of commercial reinsurance if it is not attainable.

Reinsurer→Insurer→Household

or linked to credit:

Reinsurer→Insurer→Microfinance Institution or Other Rural Lender→Household

Meso Level

At the meso level insurance is sold to intermediaries who absorb the aggregated risk exposure of their clients. The insurance helps the enterprise or organization withstand any business losses that might occur if many of their clients or members experience losses.

Reinsurer→Insurer→Bank/Cooperative/Processor

Reinsurer→Insurer→Local Charity or Non-Governmental Organization (NGO)

Index insurance can be used to protect lenders or players in the agricultural value chain that carry exposure to weather risk. Rural lenders and processors are likely to experience losses when there are major losses to agricultural production. A meso-level index insurance product is being developed for the agricultural bank in Vietnam with a pilot targeted for 2008. Local charity organizations also might benefit from using a weather index to provide contingent funding for more localized disasters that may not receive national or international attention but that warrant some assistance for affected populations.

Macro Level

At the macro level, a government or international charity organization might use index insurance as reinsurance for a disaster relief fund or to fund relief activities following a natural disaster, e.g., Mexico, Ethiopia, and Caribbean Catastrophe Risk Insurance Facility. Because the aggregate losses might be very large at this level, this coverage is often secured directly through a reinsurer who can diversify such a large risk more effectively than a local insurer could. CAT bonds could also be used in this manner just as the Mexican Government is using them.

Reinsurer→Government→Distribution Channel →Vulnerable Households

Reinsurer→International Charitable Organization→Vulnerable Households

Our Recommended Approach for Lower Income Countries

Though index insurance may not provide complete protection against losses, it addresses some of the major constraints to the development of financial markets in lower income countries and can be a first step in creating an enabling environment for rural financial services including banking and insurance (Skees, 2007).

In many cases a potentially efficient way to introduce index insurance is to begin with a product that transfers the portfolio risk of rural lenders who have exposure to natural hazards impacting agricultural and other rural enterprises, such as drought and flood (Skees & Barnett, 2006; Skees, Hartell, & Murphy, 2007).

By targeting the aggregate portfolio of a microfinance institution (MFI), lower administration and product delivery costs are achieved than by providing direct coverage to smallholder households. The transaction costs associated with providing insurance services to smallholder households can be prohibitive. Reducing the portfolio risk of rural and agricultural lenders is one way to ease the constraints to greater and more efficient complementary rural financial services.

In the future, once mechanisms are in place to transfer catastrophic risk, it becomes possible to envision several types of subsequent insurance product developments. Future products could include insurance that is more closely linked to agricultural credit and/or individual, farm-level insurance for independent risks. Other secondary products could include individual products that would reduce the basis risk of index insurance by using ground-level data to assess losses for larger farms.

In short, introducing index-based weather insurance products that get the "big risk" out of the way first can facilitate other market developments that result in more appropriate products being targeted to users operating different size farms. This approach entails a somewhat different evolutionary process for developing index insurance that begins with a linkage to lending. The model consists of four sequential development stages that correspond to increasingly greater direct individual loss indemnification.

- Step 1 — Find the big risk and create an index insurance to provide *ex ante* financing for major catastrophes
- Step 2 — If the government wants to be involved, find an appropriate role for government to share in the catastrophic risk as a means of "crowding in" the market
- Step 3 — Link the index insurance to the banking or value chain activity that will fit for micro, meso, and macro products
- Step 4 — Allow the market to develop index insurance products for small holders and more sophisticated insurance products for larger holders

Index Insurance in Developed Countries

A number of different forms of index insurance have been used in developed countries in recent years. Language differs when referring to the wide range of financial instruments that have one common characteristic — payments are made based upon an independent measure that is meant to be correlated with financial losses or human suffering. Terms like contingent claims contracts, derivatives, parametric insurance and index insurance have been used interchangeably in reference to the same financial instruments, creating some concern regarding the proper placement of the instrument for legal and regulatory purposes. Developments such as the Group Risk Plan (GRP) for the U.S. crop insurance program and the emergence of the weather market heightened concerns among the global regulators as the lines between insurance and derivatives were becoming increasingly blurred.

With the advent of Catastrophe Bonds (CAT Bonds) in the 1990s, insurance and capital markets have also become intertwined in new and creative fashions. CAT bonds are marketable securities with earnings tied to specific catastrophic events. Investors receive favorable rates of return if the catastrophic event does not occur or they stand to lose earnings or even up to 100 percent of the principal if the event does occur. The funds are used by the seller of the CAT Bonds to fund payments to insureds. Some CAT bonds have been structured using parametric indexes such as the Richter scale for earthquakes.

The obvious attraction of bringing natural disaster risks into the capital markets is the opportunity to trade the risks or securitize the risks with many buyers, providing for more efficient pricing (Doherty, 1997; Skees, 1999). Reinsurance for catastrophic risks has some well-documented limitations that include the lack of transparent pricing and cycles in insurance pricing that follow major catastrophic events (Jaffee & Russell, 1997). Given the importance of legal aspects of making distinctions between what is a derivative and what is insurance, it is worthwhile to review these distinctions before focusing on developments of index insurance in developed countries. These legal issues also become extremely important when considering how to position any advance in index insurance in developing countries.

Legal Differences between Derivatives and Insurance Products[1]

The Weather Risk Management Association (WRMA) argued in its response to the White Paper on "Weather Financial Instruments" proposed to be published by the U.S. National Association of Insurance Commissioners[2] that there is a spectrum of commercial risk transfer products available (WRMA describes these products as contingent commercial contracts). At one end of the spectrum is the traditional insurance product; at the other end of the spectrum are the various types of capital market products, including derivative contracts. The most common capital market product used to transfer agricultural risk is the weather derivative.

Although insurance products and derivatives may be considered to be positioned at different places on the spectrum of contingent commercial contracts and although they may be considered to have similar commercial and economic features, from a legal and regulatory perspective, they are entirely different products.

Insurance

Insurance contracts are usually subject to general contract law. However, in most (if not all) jurisdictions, insurance contracts are also subject to certain special principles. In the case of common law jurisdictions these special principles will usually have developed over time and will be found partially in statute and partially in case law, while in the case of Civil Law[3] jurisdictions, the special principles of insurance law will usually form part of the Civil Code or be contained in a separate insurance law. However, despite differences of detail, there are common principles that apply to insurance contracts whether drawn under common law or Civil Law systems. The effect of these special principles is that the parties to an insurance contract do not have complete contractual freedom and the contract must be designed so as to ensure that it falls within, and complies with, the insurance law of the country in which it is written.

The precise definition of an insurance contract will differ from one jurisdiction to another. In some jurisdictions the definition will be provided by statute while in others the definition will only be found through an examination of decided cases. However, even more important, there may be different definitions for different purposes. For example, there may be a different definition of an insurance contract for the purposes of defining the contractual relationship between the parties than for the purposes of the supervision of insurance business. The position in the United Kingdom serves to demonstrate this. In the United Kingdom, there is no statutory definition of insurance. The courts, through decided cases, have established a definition of insurance for contractual purposes. However, the practical effect of the relevant regulatory legislation is that it gives the insurance supervisor in the United Kingdom (the Financial Services Authority) considerable discretion to determine what is and what is not insurance business for regulatory purposes. This is a complicating factor because in such jurisdictions, understanding the legal definition is not necessarily enough. It is also important to understand how the regulator will view the product. In particular, where an insurance regulator has discretion, there is always a possibility that he will seek to reclassify a contract that is entered into between the parties as a derivative or other risk transfer product, as an insurance contract, or that he will refuse to recognize a contract entered into between the parties as an insurance contract, as insurance.

Despite the many differences between jurisdictions, there are certain core elements that are typically, but not necessarily, found in the definition of an insurance contract. These can be summarized as follows:

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[1] The following sections are largely reproduced from a paper prepared by Richard Carpenter and Jerry Skees for the World Bank in 2005. The paper is titled, Index-Based Insurance Products: Regulatory and Legal Issues.

[2] The White Paper was not, in any event, published.

[3] I.e., Jurisdictions with a codified set of laws, such as those jurisdictions whose laws are derived from the Napoleonic Code

- One party (the insured) pays a sum of money (the premium) to the other party (the insured).
- In return for the premium, the insurer agrees to accept the risk of an uncertain event occurring at a future time.[4]
- The insured must have an interest in the subject matter of the insurance (an insurable interest).
- The insurer agrees to indemnify or compensate the insured for loss or damage that he sustains upon the insured event occurring.
- The insurance contract has a specified period (the term).

Derivatives

The classic definition of a derivative[5] is that it is a financial contract or instrument that "derives" its value from some other underlying asset, rate or index. Derivatives may be exchange traded or traded privately — the "over-the-counter" (OTC) market. When used as part of a risk management strategy, derivatives will typically take the form of forward contracts and options. The parties to an OTC derivative are relatively free to agree to the terms of the contract, although the contract will usually be based on a standard model, such as the ISDA Master Agreement.[6]

Weather derivatives are financial instruments by which the purchaser seeks to hedge the risk to yields or revenue streams from weather events. The value of a weather derivative derives from the underlying weather index which could take a variety of different forms (including, for example, temperature, rainfall, snowfall, wind speed or sea surface temperature or a non-weather index, such as area yields or livestock loss).

Principal Differences between an Insurance Contract and a Derivative

The terms of a derivative contract include the payment of a sum of money from one party to the other, the transfer of risk and the stipulation of a definite contract term. They therefore share a number of the elements of an insurance contract set out above. However, there are two important legal differences:

- The typical requirement (in respect of an insurance contract) that the insured person has an "insurable interest;" in the property insured; and
- The principle that an insurance contract is designed to indemnify or compensate for loss.

There is a third difference[7] between insurance and derivatives, namely, that derivatives are usually tradable, either on a recognized exchange or privately while insurance contracts are not. As insurance is linked to an insurable interest, an insurance contract can usually only be assigned if the insured property is transferred, although there is no reason why an insured person cannot assign the proceeds of his insurance contract.

Insurable Interest

The law of many jurisdictions requires that the insured under an insurance contract must have an insurable interest in the subject matter of the insurance, although this requirement will usually be subject to certain exceptions.

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[4] Note that the uncertainty may be as to *whether* the event will occur or as to *when* the event will occur.
[5] J. C. Braddock (1997), *Derivatives Demystified: Structured Financial Products.*
[6] The ISDA Master Agreement is a model agreement published by the International Swaps and Derivatives Association.
[7] In relation to the types of products that are being discussed in this paper

The concept of insurable interest is complex and a full consideration is beyond the scope of this paper. Furthermore, the legal meaning of insurable interest[8] differs from one jurisdiction to another. For example, an English case that although decided in 1806 still represents English Law, determined, in effect, that to have an insurable interest in property, a person must have an existing right to an interest in the property or a right under contract.[9] Of course, a person will also have an insurable interest in property if he is under any legal liability with respect to that property. The definition of insurable interest is wider than this in some jurisdictions and may include, for example, a contingent interest in property.

In contrast, there is no requirement for a party to a derivative contract to have any interest in the subject matter underlying the derivative, although he may of course have such an interest.

Loss

In most jurisdictions, the insured under an insurance contract may not claim under the contract unless he has sustained a loss. It is important to note that the issue as to whether or not a loss has been sustained is a different issue to the amount that may be claimed under an insurance contract in respect of the loss. Insurance contracts often provide for an insured person to be indemnified in respect of his loss, but this is not necessarily a requirement for an insurance contract. The relationship between the actual loss and the amount that may be claimed is obviously of critical importance in the case of index insurance, where an index is being used as a proxy for loss. With respect to a derivative contract, there is no requirement that a party receiving payment under the contract has suffered a loss.

Regulatory Differences between Derivatives and Insurance Products

Given the differences between insurance and derivative products described above, they are subject to entirely different regulatory regimes.

Insurance

The insurance industry is highly regulated with the principle objectives of:

- Reducing systemic risk (by which in a regulatory context we mean the risk that a collapse of an insurer will threaten the stability of the financial markets generally); and
- Protecting policyholders.

Given that the insured policyholder must rely on, and trust, the insurer to meet his claim should the insured event take place at some time in the future, it is particularly important that the risk that the insurer will not be in a position to meet the claim is minimized.

As previously discussed, the International Association of Insurance Supervisors (IAIS) has established and published internationally accepted standards for the supervision and regulation of insurers and insurance intermediaries. The basic principles are contained in its Insurance Core Principles and Methodology published in October, 2003. However, a number of other Principles, Standards and Guidance Papers have also been produced on numerous topics, including

- Conduct of insurance business;
- Capital adequacy and solvency;
- Supervision of reinsurers;
- Licensing;
- Derivatives; and

[8] Note that a discussion on insurable interest in respect of general or non-life insurance will not be relevant to insurable interest in relation to life insurance as different considerations apply.

[9] Lucena v. Craufurd, cited in Birds' *Modern Insurance Law*, 6th Edition (published by Sweet and Maxwell)

- Insurance regulation and supervision in emerging market economies.

An examination of the IAIS Principles, Standards and Guidance Papers[10] is beyond the scope of this paper. However, jurisdictions that comply with the Core Principles will achieve the regulatory objectives stated above by submitting insurance companies, and insurance intermediaries, to a supervisory regime that includes:

- a requirement that all insurers and insurance intermediaries are licensed to carry on business, including the approval of shareholders and senior management;
- stipulating rigorous financial resource and other prudential requirements for insurers covering, in particular, capital adequacy, solvency and reserving, and closely monitoring (both on and off site) compliance with those requirements;
- closely monitoring the risk management strategies of insurers, including their use of reinsurance and other risk transfer products;
- provision for internal controls and corporate governance; and
- specifying market conduct rules for insurers and insurance intermediaries and monitoring compliance with those rules.

None of the IAIS Principles, Standards and Guidance Papers covers index insurance specifically. However, they must be borne in mind when designing an index insurance product; as such products will be subject to the same standards of supervision and regulation as any other general or short-term insurance product.

Derivatives

It is necessary to consider the regulatory position with respect to derivatives for two reasons. First, when assessing the need for an agricultural risk transfer product, it may be appropriate to consider whether the product should be an insurance product or a derivative. Second, given the legal and regulatory risk that a product designed as an insurance contract could be reclassified as a derivative product, it is necessary to consider the implications.

The regulatory position with respect to derivatives is rather more complicated than with respect to insurance. First, the legislation and regulatory frameworks of many jurisdictions have not yet made any provision for the regulation of capital market products, including derivatives. This is by no means a positive condition when considering the implementation of an index risk transfer product in such a jurisdiction, as the lack of a clear legal and regulatory framework introduces considerable uncertainty and legal and regulatory risk. Second, where jurisdictions do seek to regulate derivatives, there is not the same consistency in approach that is found with respect to the regulation of insurance. Third, for the purposes of regulation, derivatives cannot be considered to be a generic product. A derivative may be traded on an exchange, issued on the OTC or it may fall within the definition of, and be subject to regulation as, a security or as an investment.

Exchange-traded derivatives are usually subject to fairly rigorous regulatory control. However, it is unlikely that the types of risk transfer products contemplated by this paper for use in the agricultural sector would be exchange traded and they are not therefore considered further.

Participants in the OTC market are generally sophisticated and knowledgeable market participants (such as banks and other financial institutions, hedge funds and large institutions). Insofar as the market participants are themselves regulated, for example banks, insurance companies and funds, their use of derivatives, whether exchange traded or OTC, will be subject to prudential supervision by the responsible regulator. However, where the

[10] IAIS Website (www.iaisweb.org)

market players are not subject to any form of prudential supervision, the OTC market is largely unregulated.

There are a number of possible policy reasons for exempting the OTC derivatives market from stringent regulation. First, as the participants in the OTC market are sophisticated and knowledgeable, it is considered that they do not require the same level of regulatory protection as ordinary consumers and investors. Second, it has been argued that the absence of regulation with respect to weather derivatives is a positive policy choice of some governments that is aimed at encouraging the development of the market.[11] However, the effect of the absence of regulation is somewhat mitigated by the fact that model agreements, such as the ISDA Master Agreement, tend to be used to document such contracts.

The investment and securities markets are also usually subject to rigorous regulatory control, largely because investments and securities may be, and routinely are, marketed to and purchased by ordinary consumers and retail investors. Regulation of this market is through securities exchanges, the regulation of issuers (through, for example, prospectus and disclosure rules), the enforcement of stringent market abuse rules and the regulation of market intermediaries, such as investment advisors.

It should be noted that the regulatory approach to derivatives is beginning to change. For example, recent legislation in the United Kingdom, does not distinguish between market-traded and OTC derivatives. Instead it treats all derivatives, as well as securities, as investments. The level of regulation depends upon the end user. Any investment where one of the parties is a "consumer," i.e., not a professional firm or a sophisticated and experienced "market counter party" is subject to a greater level of regulation set through consumer protection provisions.

Index Insurance and Weather Derivatives in Developed Countries

Understanding developments in index insurance requires the basic background presented above regarding the legal distinctions between insurance and derivatives. The idea of index insurance is not new. As early as 1920, given the preponderance of small farmers in India, an Indian scholar was proposing area-yield insurance in the Indian context (Chakravarti, 1920), a form of index insurance that pays based on the outcome of yields in a well-specified geographic area (e.g., a county) rather than the outcome of an individual farmer yield. Independently, a U.S. scholar developed his Ph.D. dissertation on the same concept (Halcrow, 1949), arguing that moral hazard and adverse selection problems were just too great to make farm-level crop insurance workable.

Sweden offered area-yield insurance as early as the 1950s with a highly sophisticated bundled package of crops representing a portfolio of insurance products. The idea of area-yield insurance resurfaced in the United States in 1989 and area-yield insurance was added to the portfolio of products for the U.S. crop insurance program with a pilot program in 1993 (Skees, Black, & Barnett, 1997). India was on a parallel path, introducing government area-yield insurance for cropping districts in the 1980s. The India program has had very poor actuarial performance as premium rates were set on a political basis and without sound actuarial procedures.

Weather markets emerged in the United States in the late 1990s following the deregulation of energy markets. It was soon realized that extreme patterns of either cold or hot temperatures could be indexed into heating degree days and package into financial instruments that would offset the loss revenue in the energy sector that accompanied such outliers in weather patterns (i.e., a power generator in Texas would lose revenues during the summer months when temperatures are cooler than normal for an extended period; in the same manner a power generator in the Northeast would lose revenues if temperatures during the winter months are warmer than normal for an extended period).

[11] Argued by the WRMA, in its response to the NAIC proposed White Paper cited above

To be clear, weather markets have been largely unregulated markets that were mostly in the form of OTC products. Several energy companies created weather trading desks during the late 1990s and the early 2000s. These markets suffered a significant setback with the major problems at Enron. Many of the weather desks were shut down. Interestingly, many of the professionals from these trading desks moved to the insurance and reinsurance sector where they are now working on the same type of products and offering them as either insurance or derivative products. These products can be tailored to the needs of the buyer and the choice of which legal structure they take is made based on the discussion above.

The Chicago Mercantile Exchange (CME) initiated futures and options contracts based on temperature indexes in 1999. Thus, the weather markets quickly moved from OTC to exchange-traded products. These contracts are only traded for major cities in the United States and Europe demonstrating that if the volume is large enough it may be possible to develop standard derivative contracts that can be traded on large exchanges.

For more tailored products, individuals can still approach weather derivatives consultants who assist clients in quantifying their weather exposure and then structuring and ultimately placing such risk within the weather derivative risk-taking community. There are a large number of such OTC derivatives providers in both the USA and Europe.[12] The provider could underwrite the risk themselves or transfer it through counter hedges with other clients. This of course is an expensive option as the index and associated pricing model need to be developed or at least adapted specifically for the particular circumstances. Most of the transactions are therefore very large to cover the fixed cost of development.

Brief History & Current Activities in the United States, Canada, and Australia

As mentioned previously, the first area-yield insurance, the GRP, was started in 1993 in the United States. The GRP was quickly offered for seven major crops in over 1,900 counties. The program has continued to grow and in 1999, a new area-based revenue insurance product called the Group Risk Income Protection (GRIP) was introduced. The GRIP uses county yields and within-year national price movements to insure against declines in expected county revenue. Among the portfolio of FCIP policies, the acres insured under GRP and GRIP products has grown from only 2 percent of total acres insured in 1999 to 16 percent of insured acres in 2007 (USDA/RMA, 2007). In 2007, liabilities insured by the GRP and GRIP were USD 8.8 billion, 13 percent of all agricultural insurance liability coverage. Premium totals for GRP and GRIP combined were USD 650 million, or 9 percent of all agricultural insurance premiums paid. Incidentally, an examination of the total liability (13 percent) to total premiums (9 percent) for the GRP and GRIP compared to the whole market reveals that these products provide more liability coverage for less premiums than the average insurance product in U.S. markets. These area-yield products represent the most substantial U.S. experience with index-based insurance products.

The FCIP summarizes agricultural insurance uptake by policy in the United States. In 2006, the total liability for the GRP and GRIP were USD 1.05 billion and USD 5.7 billion. Premiums for the GRP totaled USD 41.9 million; premiums for the GRIP totaled USD 431 million. In that year, subsidies for these programs were 55 percent of total liability for a sum of USD 261 million. Thus, in the United States, area-yield products are as heavily subsidized as traditional agricultural insurance products. Since its inception in 1999, GRIP has experienced an average loss ratio of 0.72 while GRP has experienced an average loss ratio of 1.18 in the same time frame (USDA/RMA, 2007).

One difficulty of the summary provided by the FCIP is that costs such as unexpected administrative costs are not reported. FCIP loss ratios only include indemnities over total premiums and may misrepresent insurance industry profits. For instance in Japan, the crop

[12] See the Weather Risk Management Association membership list at www.wrma.org

insurance program created the ratio of indemnities over premiums to average to 1.0; however, administrative costs exceeded four times the premiums (Hazell, 1992). Thus, FCIP data on area-yield insurance in the United States is largely unhelpful for evaluating the potential of these products for lower income countries.

One message readers may infer from FCIP data is that area-yield insurance must be subsidized to be sustainable. While it is true that the United States contributes millions annually in premium and administration subsidies, it is *not* clear that area-yield products require subsidies to be sustainable. Experience has shown that subsidized insurance products that result in lowered farmer costs tend to "crowd out" unsubsidized insurance products that are introduced into the market. Accordingly, the fact that area-yield insurance is subsidized is a greater commentary on the political nature of agricultural insurance in the United States than on the profitability of area-yield products.

One question that remains largely unanswered is whether index insurance provides better value than traditional insurance. The literature has been somewhat mixed on this question. In general, it largely depends on the homogeneity of the area. Barnett et al. (2005) find that GRP outperforms multiple peril crop insurance (MPCI) schemes through the Midwest. Deng, Barnett, & Vedenov (2007) used data from 1,282 Georgia cotton farms, 198 South Carolina cotton farms, and 265 South Carolina soybean farms to make the same comparison. The study found that GRP performs better than MPCI in more homogeneous production regions (because of the lower basis risk). However, the findings presented in the paper indicated that even in heterogeneous production regions GRP can be a viable alternative to MPCI under certain conditions for example where the basis risk is not extreme. One reason is that with area-yield insurance lower deductibles than MPCI because the moral hazard and adverse selection problems are considerably less (Barnett et al., 2005).

Weather derivatives markets have grown and have been used to manage agricultural risk in developed countries in a limited way. From their inception in 1997, weather derivative markets have grown substantially. From April 2006 to March 2007, 730,000 weather derivatives were traded on CME or OTC. Weather derivatives on CME totaled USD 45.2 billion. Seven hundred thousand weather contracts were traded in the United States. Weather derivative trading tends to be dominated by large energy firms. Only 12 percent of weather derivative trading was for agriculture in 2006 (WRMA, 2007).

While the advent of the weather markets in the late 1990s is often cited as the impetus for a growing interest in index insurance for agriculture, it is worth noting that weather insurance products have been used in the United States for a number of years. Their success seems to be most noteworthy among specialty crops where other forms of agricultural insurance may be limited (e.g., high-valued citrus crops vulnerable to freeze). Beyond that, the use of index-based weather insurance in the United States is limited and may have been hindered by early mistakes in implementing these programs. For example, in 1988, a major insurance provider introduced drought insurance for farmers growing Midwestern crops (e.g., corn and soybeans). This effort failed in the first year due to poor underwriting decisions. The sales for the product were increasing rapidly as the sale closing date approached. Rather than consider that the farmers knew what the insurance company did not, the insurance provider extended the sales closing beyond the dates set in the original contract. The painful lesson was that farmers, once again, had information superior to the insurance provider. They clearly understood that a major drought was emerging. This explained the tremendous and growing interest — farmers knew the probability of a payout was greater than implied in the contract. The insurance provider did not have adequate resources to pay the massive losses that resulted from the 1988 drought. The issue was taken to the courts. Rainfall insurance has not been offered in the same fashion to Midwestern crop farmers since that time. This event was a major setback to what could have emerged in the U.S. markets. This experience is a reminder that mistakes in the development of these products can easily destroy or delay future opportunities (Skees, 2007).

In Canada various state agricultural insurance agencies have index insurance schemes. Canadian states did not tend to report the performance of agricultural insurance products. Quebec has had an area-yield insurance program since 1977. The program was primarily for hay crops which are very difficult to insure with traditional insurance. The state-run Saskatchewan Crop Insurance provides a number of products to farmers. Like FCIP in the United States, insurance premiums are highly subsidized in Quebec. Premiums for the Saskatchewan Crop Insurance's weather-based programs are cost-shared forty percent by producers and sixty percent by the government. In fact, Saskatchewan Crop Insurance reports, "Premiums are not used to pay corporate administration costs but are entirely for the purpose or (sic) paying claims or reinsurance costs." Three different products were offered to farmers in 2006: the Annual Crop Weather-based Insurance Program, the Forage Rainfall Insurance Program and the Corn Heat Unit Pilot Program. The Annual Crop Weather-based Insurance Program protects annual crops in the event of significant precipitation shortfalls and early fall frost. The Forage Rainfall Insurance Program protects grazing acres against below-average seasonal precipitation. The Corn Heat Unit Pilot Program insures feed and grain corn farmers against a lack of heat during the growing season (primarily being used for silage corn).

Similar weather index insurance is offered by the Canadian Manitoba Agricultural Services Corporation which has a fall frost index insurance product. In 2007 it offered excess moisture index insurance and a pasture drought insurance program in addition to its frost product. Subsidies range from 30 percent of premiums to 60 percent of premiums.

Finally the Alberta Agriculture Financial Services company offers an innovative index insurance product that uses satellite imagery to measure to index pasture conditions for ranchers. The scheme pays out when an estimate of an area's pasture growth in a given year falls below normal expected pasture growth for the same area. Satellite imagery is used because it is difficult to physically measure pasture growth on the ground because it is a perennial crop and continuously grazed by livestock. Satellite imagery can estimate pasture growth during the growing season using measurements of light absorbed and reflected by the pasture. Governments (federal and provincial) subsidize this program by sharing premium costs with producers and paying all administration expenses. The Satellite Imagery Insurance Program is limited to nine forage risk areas in the southeast and southwest portions of the Alberta. The scheme is too new to assess its success. However, there have been difficulties in gaining an understanding of the program and adjustments are still underway.

The Australian weather risk market is relatively underdeveloped. The state government of Western Australia created a task force to investigate alternatives to multi-peril crop insurance. It investigated the possibility of using weather derivatives but expressed concern that the transaction costs would put them out of reach of the average farmer. They focused on a weather index product offered by a partnership between Macquarie Bank and the U.S. firm, Aquila, which introduced a weather derivative product that allows growers to take a position on rainfall and/or temperatures. The task force thought that the combined administrative and risk premium costs would make the products unattractive to small farmers. They also had concerns about the impact of basis risk on the demand for the product. Nevertheless they decided that in spite of these concerns, these products may still be better than multi-peril crop insurance.

Brief History & Current Activities in Europe

Unsurprisingly in an era of globalization, the market for weather derivatives spread from the United States to the rest of the world very rapidly. In Europe, 18,000 weather contracts were sold from April 2006 to March 2007 (WRMA, 2007).The European bank, Société Générale was an early entrant followed by Crédit Lyonnais, ABN AMRO, Dresdner and Deutsche Bank all of whom focused on OTC deals. Insurers and reinsurers followed soon afterwards with Swiss Re, ACE, AXA and XL, all involved in the weather insurance market.

As in the United States, Canada and Australia, index weather derivatives are largely the domain of large companies who can afford or are willing to pay for these instruments. Power companies remain the overwhelming purchasers of weather derivatives in Europe as in the United States. There are no obvious differences in the weather derivatives market in Europe and the United States in terms of the nature of the brokers, the indexes themselves, or nature of the end users.

No instance of area-yield index insurance was found in Europe. European agricultural insurance is heavily subsidized. Almost all countries in Western Europe subsidize agricultural insurance (EU Commission, 2001), which as in the United States can crowd out the development of alternative risk management products.

Key Lessons from the Developed Countries

With respect to the weather derivatives market, although there is some move away from it being focused almost exclusively on the energy sector, the shift is taking very long. In 2006 almost half of all weather derivatives end users in the PriceWaterhouseCoopers survey were energy firms (PriceWaterhouseCoopers, 2007). About 12 percent were in the agriculture or agribusiness sector. In principle, weather derivatives have applications for countless private sector industries affected by weather and even from the state sector for example national and local governments who incur higher costs not only as a result of extreme weather events but also from less extreme events like unusually heavy snowfalls.

It is unclear why other sectors have not adopted the use of weather derivatives as rapidly as has the energy industry. Part of the reason could be that the energy sector experiences less basis risk than other industries in the instruments that it uses — primarily derivatives based on temperature indexes of large cities. Some have argued (Roth, Ulardic, & Trueb, 2007), that part of the issue may be a lack of market education.

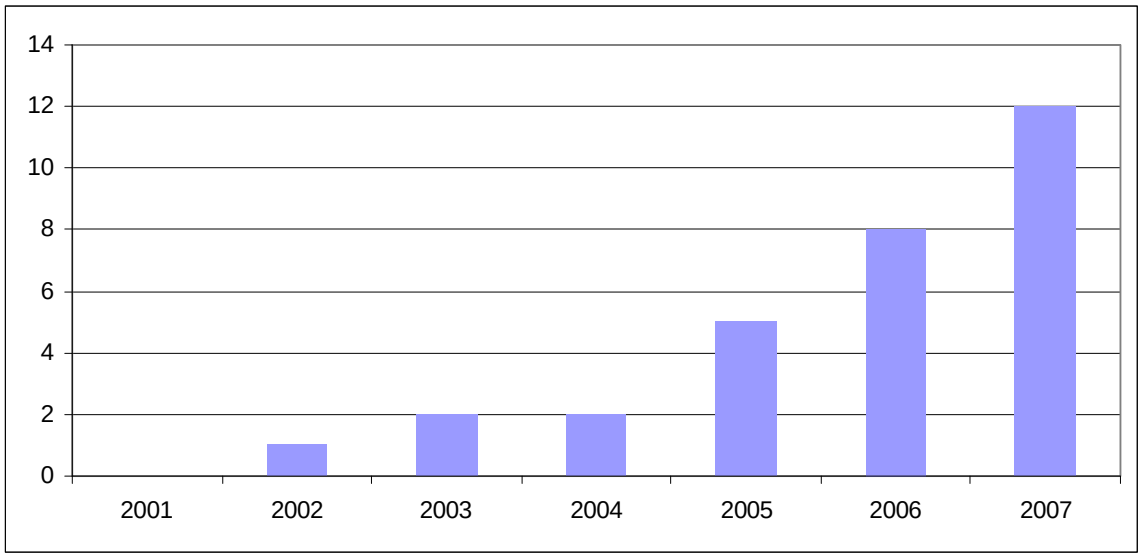
The major lessons to be drawn from the use of weather derivatives (be they OTC or exchange-traded derivatives) is that while the may have some limited use for sophisticated users in developing countries like large banks or agribusinesses in the value chain, thy are generally not well suited for developing countries. Weather derivatives are standardized products which require sophisticated markets and regulation, all of which are constraints to their use for agriculture in developing countries. In would be particularly problematic to attempt to use them for small farmers.

In general, the potential application of weather derivatives for agriculture in developing countries is limited. The small number of agricultural applications of weather derivatives in developed countries is primarily for agribusiness with large holdings. For most agricultural settings, products need to be tailored to specific and localized conditions to be of value. Furthermore, in areas with underdeveloped financial sectors, the infrastructure, regulatory environment, and experience with exchange markets are all likely to be inadequate to support the development of weather derivatives. While OTC trades are custom-tailored transactions that do not rely on market volume as exchange-traded derivatives do, the fact that they are unregulated and there is great opportunity for fraud, limits their value for developing countries. As for exchange-traded derivatives, these products are standardized and must be listed on an exchange with enough market volume to generate activity. Active trading to dynamically price weather insurance is not practical for many of the highly tailored products that must be developed to transfer special forms of weather risk. None of this is to suggest that weather risk instruments can not be implemented in developing countries. Rather it is to reemphasize a strong message: the products must be introduced as insurance products where there is at least some chance that they can be regulated in an appropriate fashion.

Index Insurance in Developing Countries

In all, 25 index-based risk transfer schemes were identified in developing countries. The vast majority of these products are insurance products, though South Africa and new pilots in Mali, Kenya, and Ethiopia offer weather derivatives. Mexico employs an index-based CAT bond to provide contingent financing for natural disasters. These projects are in various states of development from the initial stages proposals and feasibility studies to small pilots, to currently operational schemes, to closed projects. All of the schemes are only few years old. Figure 4 shows the increasing interest in these products by the number of index insurance schemes in operation each year. Table 2 provides an overview of various index insurance projects in developing countries.

FIGURE 4: NUMBER OF INDEX INSURANCE PILOTS



Source: Authors

The case studies that follow provide a more detailed examination of some select cases. The implication of this is that while we can and should draw lessons from existing case studies, it is too early to draw any definitive conclusion on whether or not index insurance can be judged a success and therefore a worthy candidate for massification.

Table 2 Summary of Index-based Risk Transfer Products in Lower Income Countries

Country	Risk Event	Contract Structure	Index Measure	Target User	Status
Bangladesh	Drought	Index insurance linked to lending	Rainfall	Smallholder rice farmers	In development. Pilot launch planned for 2008.
Caribbean Catastrophe Risk Insurance Facility	Hurricanes and earthquakes	Index insurance contracts with risk pooling	Indexed data from NOAA and USGS	Caribbean country governments	Implemented in 2007
China	Low, intermittent rainfall	Index insurance	Rainfall and storm day count	Smallholder watermelon farmers	Implemented in Shanghai only in June 2007. Includes a 40% premium subsidy
Ethiopia	Drought	Index insurance	Rainfall	WFP operations in Ethiopia	USD 7 million insured for 2006. Policy not renewed for 2007 due to lack of donor support.
Ethiopia	Drought	Index Insurance	Rainfall	Smallholder farmers	2006 pilot, currently closed due to limited sales.
Ethiopia	Drought	Weather Derivative	Satellite and weather data	NGO	Implemented 2007
Honduras	Drought		Rainfall		In development
India	Drought and flood	Index insurance linked to lending and offered directly to farmers.	Rainfall	Smallholder farmers	Began with pilot in 2003. Now index insurance products are being offered by the private sector and the government
Kazakhstan	Drought	Index insurance linked to MPCI program	Rainfall	Medium and large farms	In development
Kenya	Drought	Weather Derivative	Satellite and weather data	NGO	Implemented 2007
Mali	Drought	Weather Derivative	Satellite and weather data	NGO	Implemented 2007
Malawi	Drought	Index insurance linked to lending	Rainfall	Groundnut farmers who are members of NASFAM.	Pilot began in 2005. 2500 policies sold in 2006 pilot season. $7000 in premium volume.
Mexico	Natural disasters impacting smallholder farmers, primarily drought	Index insurance	Rainfall, windspeed, and temperature	State governments for disaster relief. Supports the FONDEN program.	Pilot began in 2002. Available in 26 of 32 states. Currently 28% (2.3 million ha) of dryland cropland is covered
Mexico	Major earthquakes	Index-linked CAT bond and index insurance contracts	Richter scale readings	Mexican government to support FONDEN.	Introduced in 2006. CAT bond provides up to USD 160 million. Index insurance coverage up to USD 290 million.

Table 2 Summary of Index-based Risk Transfer Products in Lower Income Countries

Country	Risk Event	Contract Structure	Index Measure	Target User	Status
Mexico	Drought affecting livestock	Index Insurance	Normalized Difference Vegetation Index	Livestock breeders	Launched in 2007. Sum insured USD 22.5 million across 7 states. Insured 913,000 cattle.
Mexico	Insufficient irrigation supply	Index insurance	Reservoir levels	Water users groups in the Rio Mayo area	Proposed
Mongolia	Large livestock losses due to severe weather	Index insurance with direct sales to herders	Area livestock mortality rate	Nomadic herders	Second pilot sales season of pilot completed in 2007; 14% participation
Morocco	Drought	Index Insurance	Rainfall	Smallholder farmers	No interest from market due to declining trend in rainfall
Nicaragua	Drought and excess rain during	Index insurance	Rainfall	Groundnut farmers	Launched in 2006.
Peru	Flooding, torrential rainfall from El Niño	Index insurance	ENSO anomalies in Pacific Ocean	Rural financial institutions	Proposed
Peru	Drought	Index insurance linked to lending	Area-yield production index	Cotton farmers	Proposed
Senegal	Drought	Index insurance linked to area-yield insurance	Rainfall and crop yield	Smallholder farmers	Proposed
Tanzania	Drought	Index insurance linked to lending	Rainfall	Smallholder maize farmers	Pilot implementation in 2007.
Thailand	Drought	Index insurance linked to lending	Rainfall	Smallholder farmers	Pilot implementation in 2007.
Ukraine	Drought	Index Insurance	Rainfall	Smallholders	Implemented in 2005, currently closed due to limited sales
Vietnam	Flooding during rice harvest	Index insurance linked to lending	River level	The state agricultural bank and, ultimately, smallholder rice farmers	In development, a draft business interruption insurance contract is being considered by the state agricultural bank

Source: Authors (a version of this table also appears in Barrett et al., 2007)

Lessons from Developing Country Projects

Ongoing Programs

India: Rainfall Index Insurance

Project details

In 2003, BASIX (an MFI), partnering with ICICI Lombard (an insurer) and receiving technical assistance form the Commodity Risk Management Group of the World Bank, introduced a rainfall-index insurance to address high default rates and increase lending opportunities in rural sectors. BASIX conducted a pilot study, selling weather insurance to 230 farmers in Andhra Pradesh during the 2003 monsoon season, June to September. The 2003 pilot was designed to protect farmers from drought during the groundnut and castor-bean-growing season (Manuamorn, 2007). A key variable in the introduction and the extra efforts to promote rainfall insurance by financial interest in India is likely the regulatory requirement that for insurance companies operating in India at least 5 percent of their premium volume must come from products sold in rural areas. These actions also make it more difficult to sort out the long-term profitability of these new insurance products as the explicit strategy may be to cross subsidize their development in the early years so as to meet this regulatory requirement.

As these products were introduced, it seems that ICICI Lombard was the leader in the market. IFFCO-Tokyo was quick to follow. Additionally, the Agricultural Insurance Company of India (AICI) has also followed the lead of ICICI. In the early years, the products were very similar. The market is now developing and differences in product offerings and design are emerging. Of some concern, the AICI is replacing some of the traditional crop insurance in certain states (e.g., Karnataka) with weather insurance. They will also introduce a subsidy for these products. It is unclear if private companies selling weather insurance will be eligible for the subsidy. This action could significantly damage an emerging new market in India.

Development trend

In 2004, BASIX sold rainfall index insurance to 700 farmers (Bryla & Syroka, 2007). By 2005, BASIX sold insurance to 6,703 customers in 6 states in India (Ibarra & Syroka, 2006). In 2006, BASIX provided rainfall insurance to 14,000 farmers. In 2007, 5,500 farmers purchased rainfall insurance. Reduced farmer participation is likely due to changes in the insurance contract structure. While the total number of farmers covered has dropped by over half, the total sum insured decreased from INR 437,000 in 2006 to INR 425,000 in 2007 indicating that index insurance covered higher liabilities per farmer. From 2003 to 2007, BASIX has made 3,000 claims for a value of INR 3 million (USD 73,000).[13] Reports on renewal of weather index insurance in India vary widely. The range has been between 20 and 70 percent. We believe these discrepancies can be explained by the different regions and different delivery systems that are involved with these products. Undoubtedly, the products are in the early stages and there is some sorting to be done.

Due to the success of BASIX with the 2003 pilot, other insurers also began selling rainfall insurance in 2004. For instance, IFFCO-Tokyo also launched weather insurance contracts, selling over 3,000 policies to farmers throughout India. In addition, the state supported insurance program, the AICI, began offering index insurance in 2004, reaching 13,000 farmers, and in 2005, it sold 120,000 of the 250,000 index insurance policies sold in India that year. In 2007, AICI insured the *kharif*[14] for excess and deficit rainfall for eight crops in 70 *hoblis*, which are small clusters of villages. AICI underwrote 40,000 hectares with a total liability of USD 12 million and premium totaling USD 1.5 million. AICI also provides index

[13] Email correspondence between GlobalAgRisk and BASIX.

[14] Kharif crops are the summer or monsoon crops that are ready for Autumn harvest.

insurance during *rabi*, the winter growing season, for rainfall, frost, heat, and humidity risks for 12 crops. For the rabi of 2007/2008 AICI expects to insure up to a million hectares for a liability of roughly USD 350 million and premium of USD 30 million.

In 2007, ICICI Lombard continued to partner with BASIX but delivered index insurance through other channels, as well. ICICI Lombard has sold index insurance in 140 locations in 13 states to over 200,000 farmers for rainfall, temperature, and humidity risks, and though its contracts are not crop specific, it has covered groundnut, castor bean, soy bean, paddy, cumin, cotton, coriander, fenugreek, wheat, oranges, grapes, apples, and peaches. Both ICICI and AICI link insurance products to lending. In 2006, it is estimated 300,000 farmers purchased index insurance. India has over 100 million farmers.

Product Evolution

BASIX Rainfall Insurance Product

In 2004, the second pilot year included significant changes in design based on customer feedback from the first pilot year. Geographically, the pilot was expanded and included 4 new weather stations in Andhra Pradesh. The product now had a 3-phase payout that weighted the importance of rainfall during specific stages of the production process in hopes to reduce basis risk. An excess rainfall contract was offered to groundnut and castor-bean farmers for the third phase of payout. Contracts were also offered to cotton farmers. BASIX improved accessibility to insurance by reducing costs of delivery by simplifying the underwriting process and training loan agents to sell index insurance. Additionally, BASIX bought index insurance policies from ICICI to protect its loan portfolios.

In 2005, BASIX scaled up the weather index insurance program, selling it in 6 Indian states. The product was again modified based on farmer feedback. New features included dynamic start dates that were based on the start of the summer monsoon season and the product was changed to exclude daily rainfall under 2 mm or over 60 mm from the cumulative total determining payout. Also, instead of continuing to sell crop-specific policies, BASIX sold area-specific generic weather insurance products suitable for all principal rain-fed crops within the region (Manuamorn, 2007).

In 2007, BASIX modified their index insurance product so that households must purchase coverage for all three phases of production. BASIX seems to have recognized households were purchasing index insurance for such limited liability that it was not providing adequate coverage for catastrophic weather risk. This change in contract structure is likely due to the overarching goal of BASIX of livelihoods promotion, which includes helping households effectively integrate index insurance into a larger portfolio of risk management mechanisms.

AICI Index Based Weather Insurance Products

Unlike rainfall insurance offered by BASIX, AICI products were crop specific. For groundnut, AICI contracts differed from the generic BASIX contract in that it was divided into 4 stages for deficit rainfall and 2 for excess rainfall and had a specific start date of June 10. Unlike the dynamic start date that depends on at least 50 mm of rainfall in June offered by BASIX, AICI insured a 21 day sowing period (June 10–June 30) in which rainfall must reach 30 mm over any three consecutive days. In this way, AICI insures that soil moisture conditions needed for planting are met.

Other results

Several factors affected rural households' willingness to purchase insurance (Giné, Townsend, & Vickery, 2007):

1. **Understanding of the insurance product.** Individuals who had knowledge and familiarity with insurance and understood the payout structure were more likely to buy rainfall-index insurance. Farmers in India tend to judge rainfall in terms of soil

moisture and some had difficulty estimating how many millimeters of rainfall would be necessary for production.

2. **Participation in a pre-existing network.** Local influential progressive farmers and self-help group participation affected uptake. If these farmers and groups supported the insurance product, purchasing and marketing it, others were more likely to buy. These farmers and groups are important entry points for introducing new technology into a village. BASIX customers were 143 percent more likely to purchase index insurance
3. **Perceptions of risk.** Farmers' perceptions of future weather events affected uptake. As a result, only farmers who believed that the risk was underpriced participated. Individuals who had experienced severe drought in the past were more likely to purchase weather index insurance as a precautionary measure. Other farmers delayed their purchase decisions until they could obtain some information about the upcoming monsoon. Some farmers believed the monsoon season would start earlier and lead to more rainfall than would trigger a payment. These farmers were unwilling to purchase the insurance because they believed it was priced too high. Other farmers expected the monsoon season to start later and that the risk of drought was high. These farmers tended to purchase the insurance because they believe it is under priced. When sales closings are set too late, farmers can use observation and experience to forecast rainfall for the upcoming season. This information gives farmers an advantage and can result in operating losses for insurers in the long-term. Sales closing dates should be before forecasting indicators are available to protect insurers from this asymmetric information problem.
4. **Access to other risk management strategies.** Some farmers had an array of *ex post* strategies including buffer stocks, access to credit, and asset holdings. As a result, these farmers tended to be able to smooth consumption and were less interested in purchasing formal insurance. Other farmers who only had informal insurance through a village network were more willing to purchase the insurance.

Factors not significantly affecting uptake include external factors of cash available on day of sale, basis risk based on distance from weather station, and access to irrigation.

Future Plans

ICICI Lombard wants to extend the product to other low income business sectors that are dependent on weather such as quarrying, brick makers, and salt production. ICICI Lombard has also invested in increasing meteorological infrastructure, which has limited the expansion of index insurance in some rural areas.

Key Implementers and Funders

The World Bank CRMG provided support for the feasibility assessment. CRMG worked directly with ICICI Lombard and BASIX to develop the product and take it to market.

Mongolia: Index-based Livestock Insurance

In 2001, an index insurance program, Index Based Livestock Insurance (IBLI) using a livestock mortality rate by species and county was recommended to the Government of Mongolia by the World Bank. The scheme was designed in response to massive livestock losses from severe winter weather that killed a third of all the livestock over the course of three years (2000–2002). The Government of Mongolia (GoM) was began a three year pilot program in three provinces of Mongolia, Bayankhongor, Uvs and Khenti, starting with sales in the spring/summer of 2006.

Product details

The IBLI scheme uses a single index to segment a role for a commercial insurance product and a role for the government in providing disaster assistance. A weather-based proxy was

first considered as the index for this insurance product; however, the infrastructure to measure and record weather data was regarded as inadequate. Additionally, the winter risk is a complex dynamic of many different weather and geographic factors that is difficult to isolate the specific conditions that create losses. Instead, the World Bank recommended a product to indemnify herders based on the mortality rate of animals in a given area. A mid-year estimate of livestock mortality, by species, is used to calculate payouts for losses occurring in the first 6 months of the year when livestock are vulnerable to extreme winter conditions.

The Base Insurance Product (BIP) is a commercial risk product, sold and serviced by insurance companies. This product pays out when the mortality rates for the first 6 months of the year exceed specified mortality thresholds. Herders can choose between thresholds of 6 percent or 10 percent mortality by species. The maximum payment for the BIP would occur when mortality rates reach a specified "exhaustion point" of 25 percent or 30 percent depending on the province. Losses above this limit are paid by a Disaster Response Product (DRP); this is a social safety net product financed and provided by the GoM. DRP coverage is free to herders who have purchased the BIP. Herders who have not bought the commercial insurance only pay a small administrative fee to register to the DRP. Both products are offered through insurance agents, though the GoM absorbs all DRP losses.

Due to the nascent insurance sector in Mongolia and poor past experiences with livestock insurance, the BIP premium received by all participating companies is placed in a secure structure, an indemnity pool, which houses premiums until all claims are settled. The remaining balance is then distributed back to the companies as profit. The Livestock Insurance Indemnity Pool is currently reinsured by the Government of Mongolia who provides an unlimited stop loss facility. Insurance companies pay a reinsurance premium to the GoM. The funds are deposited into a reserve to pay excess losses on the BIP. The Gom also has access to financing for large losses through a USD 5 million contingent credit facility provided by the World Bank.

Development trend

During the initial pilot season in 2006, 2400 policies sold with a premium total of MNT (Mongolian Tugrik) 83,775,822 (~USD 70,000). In 2007, 3700 policies sold which represents close to 13 percent of eligible herders and 10 percent of livestock in the pilot areas. Total premium in 2007 were MNT 129,047,464 (~USD 109,000). This is a 65 percent increase over the first year of sales. Four insurance companies sold the pilot in 2007. Renewal rates from 2006 to 2007 were about 35 percent. Independent registration with DRP was very low. This could be due to the fact that insurance companies are not promoting this product. The project management team is considering a separate delivery system for DRP to make it more accessible to herders.

Product evolution

In the first pilot year the payment threshold for BIP was set at 7 percent mortality. Some herders expressed a preference for having a lower threshold, while others wanted a lower premium. In response to this feedback, two threshold options were offered for the second sales season. Herders can choose between a 6 percent threshold and a 10 percent threshold. The premium rate is adjusted for these rates, a higher rate at 6 percent than at 10 percent.

The sales season was also extended to correspond better to times when herders have more cash on hand to purchase insurance.

Plans are also underway to link BIP to rural lending to improve herders' access to credit and to remove some of the banks' risk of lending to herders who may lack traditional sources of collateral.

Other results

Several innovations in IBLI structure are noteworthy. First, by providing both a market-based component, the BIP, and a social, government-supported component, this structure provides herders with risk layering in that herders retain small losses, larger losses are transferred to the private insurance company, and catastrophic losses are borne by the government. This type of public-private partnership may be an appropriate model for other country projects. Additionally, herders who chose to purchase the BIP gained increase access to credit at lower interest rates. This is a result of these herders' decreased risk exposure to large and catastrophic livestock mortality.

This project required a great deal of marketing expenditures to generate public awareness. Unlike other index insurance projects, no suitable pre-existing network was identified to partner in marketing and education efforts; however, the sparse population and nomadic lifestyle of herders created opportunities for "face-to-face" education with nearly all of the potential insured.

Future plans

Technical assistance by the USDA National Agricultural Statistics Service is working to increase efficiency and accuracy in animal census procedures. Alternative delivery models are also being pursued. Developers want to create a more formal link between index-insurance and credit through agricultural lenders and microfinance institutions and to organize index based livestock insurance policies through herder self-help groups who could facilitate informal risk sharing mechanisms within the group. Both of these approaches would rely on existing networks for delivery to lower transaction costs and increase product penetration into rural areas. Additionally, the contingent credit facility is a short-term solution provided by the World Bank with the longer-term goal of attracting international reinsurers to underwrite the catastrophic risk. The project will support continued research to reduce basis risk by incorporating other indexes, for example, the Normalized Difference Vegetation Index.

Key implementers and funders

World Bank (project support and contingent loan contract); FIRST and PHRD (supporting technical assistance), the GoM Ministry of Finance is implementing the project and supports the Project Implementation Unit; local insurance companies (product providers).

Malawi: Index-linked Crop Insurance Project

Project details

Groundnut farmers in Malawi wanting to plant with certified groundnut seed were unable to obtain credit because of the high default risk in the event of a drought (Alderman & Haque, 2007). A drought in 2004–05 led to high default rates for agricultural loans ranged from 30 percent to 50 percent in Malawi resulting in many lenders refusing to offer credit for agriculture (Mapfumo, 2007). A pilot was launched in the 2005–06 growing season linking two lenders, the Insurance Association of Malawi, and NASFAM (a smallholder farmers union; Alderman & Haque, 2007). The two lenders provided loans to smallholders who agreed to purchase index insurance. The loan covered the costs of seed and insurance premiums (Opportunity International, 2005).

Product details

The weather insurance contract is based on rainfall and pays indemnities if the rainfall needed for groundnut production is insufficient. The insurance product relies on rainfall measurements during critical periods of groundnut production and pay outs are priced by the relative importance of rainfall during each of these stages. During the establishment and vegetative growth stages, if rainfall at the closest weather station is below 60mm, the insurer

pays a certain amount per millimeter until 30 mm. If the amount is below 30mm, the crop is expected not to recover and the total sum assured is paid. Similar arrangements exist for subsequent sowing phases (Alderman & Haque, 2007). This insurance contract also covers the "NO" sowing season in which if there is insufficient rainfall for sowing groundnut seed during the sowing season, a payout is made (Opportunity International, 2005).

Farmers who purchase the index insurance agree to sell their yields to NASFAM. NASFAM acts as a delivery channel for the loan and insurance payouts. NASFAM deducts the price of the loan from its payments to farmers for their yields. Insurance policies only cover the cost of seed for which farms borrowed from the bank; premiums were 6–7 percent of loan values. In the event of a payout, NASFAM deducts the amount from the farmer's loan and passes the payout on to the bank. NASFAM deducts the left-over loan liability from farmers' yield proceeds. In the event of a total payout, indemnities equal the value of the loan, and NASFAM does not deduct any amount from yield proceeds for loan payments (Opportunity International, 2005).

Development trend

The product has been piloted in 4 areas. In 2005/2006, 892 farmers purchased weather insurance for a total sum insured USD 35,000. In the 2006/2007 growing season farmer uptake increased and a rainfall-based insurance contract was also offered for maize production. Table 3 presents detailed statistics from the 2006/2007 season.

Table 3 Weather Insurance in Malawi (2006/2007 Season)

	Groundnuts	Maize
Number of farmers	1,710	826
Total acreage insured	1,738	826
Total sum assured (USD)	65,928	46,524
Total premium (USD)	5,194	5,238

Product evolution

For the 2006/2007 season, the project was expanded geographically, and included maize for the first time. Clients identified the need for credit to buy Maize seeds during focus groups conducted by the Micro Insurance Agency. Investments in infrastructure including a new weather station and the installation of digital weather stations have allowed the project to expand. Additionally, lenders purchased group policies on behalf of their borrowers. By taking this approach, lenders can increase access to credit for farm households and pass insurance benefits to borrowers in the event of indemnity payments.

Other results

Client uptake of the rainfall index insurance product may have been inhibited by the good 2006 groundnut crop. No claims were paid and there was no demonstration effect. However, farmers report yields for using hybrid seed rose by 140 percent (Mapfumo, 2007). The high yields of groundnuts pushed down the price to a point where farmers reported struggling to afford insurance premiums.

Future plans

The Government of Malawi reports wanting index insurance scaled up to other crops and industries. The first two pilots were conducted without regulatory oversight; however, further expansion of the program includes developing a regulatory framework. Education for insurers and insurance regulators regarding this framework began in September 2007.

Key implementers and funders

Project coordinator: Shadreck Mapfumo, Micro Insurance Agency.; Product pricing: World Bank's Commodity Risk Management Group and IRI of Columbia University.; Agent: NASFAM; Field services: NASFAM and Malawi's Ministry of Agriculture; NASFAM acts as an agent for Opportunity International Bank of Malawi (OIBM) and Malawi Rural Finance Corporation (MRFC); Insurers: Insurance Association of Malawi.; Rainfall data providers: Malawi Met Offices.

Mexico: Drought Insurance

Project details

The Mexican government has developed a natural-disaster fund, FONDEN, to relieve low income victims and to rebuild uninsured infrastructure in the event of catastrophic losses. FAPRACC is a subsidiary of FONDEN and was developed to provide immediate relief in the event of natural disasters to subsistence farmers who do not have access to formal insurance markets. FAPRACC offers contingent payments in the case of catastrophic losses due to several extreme-weather events including severe drought, frost, hail, windstorm, excessive rainfall, and flood. In 2002, Agroasemex, a government-owned reinsurance company, began a pilot study selling weather-index insurance at the state level to finance the state's liabilities for FAPRACC. (Agroasemex, 2006)

Product details

Catastrophic losses are determined at the state level. Payments for FAPRACC are divided such that the state declaring the disaster is responsible for 30 percent and the federal government is responsible for 70 percent. Mexican state and federal budgets have absorbed these costs and have been put under considerable constraints because of them. Therefore, the Mexican government began pursuing innovative insurance paradigms to improve the sustainability of these disaster-relief programs. Conducted in the Mexican state Guanjato, this pilot insured maize against drought based on rainfall statistics from local weather stations. Agroasemex bore 50 percent of the risk and passed the remainder of its liabilities on to international reinsurers. The pilot offered contracts at the weather station level, no longer requiring catastrophic losses to be determined at the state level. In addition, drought was predetermined on the basis of the rainfall index instead of by government declaration, which had been subject to political pressure. Local technical commissions provided quality control by checking weather stations' reports of drought conditions against the impact on local farms.

Development trend

Due to satisfaction at both the federal and state levels with the pilot study, Agroasemex has extended the program each year to other states and for additional crops. In 2006 coverage was being offered in 26 regions of 32 states on 28 percent (2.3 million hectares) of non-irrigated cropland. The sum insured for 2006 was USD 84.7 million with premiums totaling USD 9.5 million. In 2007, the sum insured was 90 million with a premiums total of USD 9.7 million (Agroasemex, 2007). Further expansion has been hindered by lack of meteorological infrastructure; however, Agroasemex is working on identifying new sources of data and new techniques for utilizing shorter time series of data. (Agroasemex, 2006)

Product evolution

The index policies continued to insure for drought but expanded the types of crops insured to include maize, sorghum, barley, and beans. Diversifying against drought across 32 states for several crop varieties has allowed Agroasemex to further insulate its portfolio from risk.

Other results

The pilot study and its extensions are part of a larger scheme that hopes to increase farmer access to insurance. Further penetration of formal insurance markets is needed in Mexico,

and disaster relief should be but one component of a larger paradigm for mitigating risks among rural farm households. However, at the state level, weather-index insurance has thus far been a success for the Mexican government as it has improved the sustainability of one of their natural disaster funds by transferring risk from state budgets to national and international reinsurers.

Key implementers and funders

Agroasemex (government-owned reinsurance company); FONDEN (government disaster relief program); FAPRACC (government disaster relief program, subsidiary of FONDEN), SwissRe (international reinsurer)

Discontinued Programs

Ethiopia: Micro and Macro Weather Insurance

Project Details

To help address food insecurity issues in Ethiopia, two agricultural risk management structures were considered: one at the farmer (micro) level and the other at the government (macro). This resulted in micro-level weather insurance and macro-level ex ante funding of emergency relief operations.

Ethiopia: Index-linked Crop Insurance

Product details

A small pilot weather insurance program was launched for maize farmers in Alaba, a region of Southern Ethiopia. The insurance protected farmers against rainfall shortages during the maize growing season.

Development trend

Only 30 policies were sold during 2006.

Product evolution

Closed after pilot

Other results

Key Reasons for Failure

Insufficient quantity and quality of weather data. The weather observing network and available weather data in Ethiopia was insufficient. The spatial distribution of the 500 weather stations and rain gauges were inadequate. Basis risk remained at unacceptable levels. Only farmers living near good weather stations were in a position to benefit from the insurance product.

Lack of pre-existing rural network. The pilot failed to identify any organizations that could be used to reach clients effectively and provide capacity building and product education to farmer clients. Commonly, banks act as a distribution agent, but in this case no banks were willing to get involved since their fertilizer loans (to farmers) were already guaranteed by the government. As the insurance company had no existing goodwill in the region, it was unable to inspire trust among skeptical farmers.

Inability to secure reinsurance. The Ethiopian Insurance Corporation was unable to secure international reinsurance. This is likely due in part to the small values for this risk transfer and may be remedied by increased client uptake of the product.

Ethiopia: Macro-Level Weather Insurance

Product details

Ethiopia contains approximately 17 million farmers (Syroka & Wilcox, 2006). The entire Ethiopian economy and food security for rural households can be threatened by low rainfall that damages agricultural production (Skees et al., 2006). In 2006, the WFP purchased a weather index insurance contract to protect Ethiopia from extreme drought during its agricultural season.

Purchased from a European reinsurer, AxaRe, the insurance contract is based upon rainfall data from 26 weather stations throughout Ethiopia for the March to October growing season of 2006 (Syroka & Wilcox, 2006). In the event of a drought, the WFP will use indemnity payments to fund some of the aid relief for food insecure households and needy agricultural producers. The specific value of the payments are contingent upon the level of rainfall; however, the amount of protection purchased is only a fraction of the total costs WFP would face in Ethiopia in the event of a severe drought, thus illustrating a risk management plan that blends *ex ante* financing and food reserves (Skees et al., 2006).

Development trend

The contract was not renewed after 2006.

While *ex ante* funding for disaster relief represents a promising outlet for index insurance, it may be best suited for entities that have relatively limited access to capital for emergencies, such as NGOs and governments of lower income countries (Skees et al., 2006). WFP is supported by higher income countries, and in the event of a natural disaster, it typically has a wealth of resources at its disposal.

Key implementers and funders

WFP- Target User, AxaRe- Reinsurer, Government of Ethiopia

Morocco: Rainfall Index Insurance

Project details

In 1995 the Moroccan government introduced the program, “Secheresse” (Drought Program), a state sponsored yield insurance scheme. The program was very popular (in 2002 subscriptions reached 80 percent of the 300,000 authorized hectares), but was affected by high costs associated with fraud, monitoring for moral hazard and adverse selection, and loss adjustment. In 2001 the Moroccan Government agreed to a World Bank project to evaluate the possibility of introducing weather index insurance.

Product details

The product, based on a rainfall index, was more sophisticated than many index products including multiple triggers in an attempt to reduce basis risks. The product weighted the different plant growing phases and introduced a rainfall “cap” that accounted for the occurrence of rainfall in excess of the soil storage capacity resulting in a close correlation coefficient with cereal production. Though the complicated structure reduced basis risk, farmer test groups did not seem to be impressed with these changes and may have had more difficulty in estimating the value of the product.

Development trend

The rainfall index insurance was to be sold through branches of the agricultural mutual insurance company, MAMDA, as it had a significant presence in rural areas and already managed the state sponsored Drought Plan.

Product evolution

Implementation never took place. The rainfall precipitation data in the selected implementation areas showed a downward trend. Based on this information the reinsurance company that was prepared to accept the risk proposed a high premium that could not be passed on to policyholders.

Key implementers and funders

World Bank — Technical Assistance; MAMDA (an agricultural mutual insurance company) — Insurer; Italian Government - Donor

Key Lessons Learned in Implementing Index-based Products in Developing Countries

In addition to the preconditions for developing an effective index that are described in the opening section of this paper, the success of an index insurance scheme is dependent upon many other factors. This section outlines lessons learned from case studies where index insurance programs have been implemented and highlights some of core hindrances to index insurance that are particularly important in a developing country setting. Certain hindrances undermined the success of several of the outlined case studies.

Hindrances to Successful Product Development and Massification & How to Address Them

Formal insurance provides a way to transfer risks from households to insurers. These risks carry the potential of financial losses, and when a risk event occurs, insurers help pay for the loss. Insurers agree to do this because, with uncorrelated risks, they can protect themselves by pooling risks for lots of individuals. Since the risks are uncorrelated, it is unlikely that many people will experience risk events at the same time. However, for the type of correlated, high-magnitude risks for which index insurance is best-suited, many households are likely to be affected by a loss. As a result, insurers could be required to pay many or even all their clients after a high-magnitude event, such as a flood. This possibility requires insurers to have immediate access to large amounts of capital. Many insurers do not have this option. Also, maintaining an asset portfolio of cash holdings limits these resources from opportunities of investment and expansion. Without sufficient financing to cover correlated losses, insurance companies can become insolvent if a major disaster occurs. Therefore, insurers need other approaches to address correlated risk exposure.

Reinsurance is a viable option to transfer correlated risk from local insurers. Risks that affect a whole region or community are best managed on international markets where risk portfolios can be diversified across weather events around the world. Ideally, risk is transferred from local communities to reinsurers involved in international markets. However, gaining access to reinsurers may require insurers to meet internationally recognized best practice standards and governments to have appropriate insurance legal and regulatory enforcement. Projects in lower income countries will sometimes fail to meet these standards and may be unable, initially, to attract reinsurers. In this case other financing solutions are needed.

When countries do not have access to global reinsurance, governments or donors can transfer risks from local insurers. In Mongolia, for example, the government provides reinsurance for the IBLI program and has contingency plan of an emergency loan from the World Bank to help manage catastrophic events. This arrangement is not sustainable but it is used in the short-term as institutions and systems are strengthened to meet international standards and obtain commercial reinsurance.

While this alternative could create great opportunities for rural development through insurance markets, governments should carefully consider the costs of such an arrangement. This solution can create great financial exposure for governments, and in the event of a natural disaster, government budgets will likely be significantly strained.

Forecasting Weather Events

Farm households often have means of forecasting the weather based on observation and experience. Sales closing dates must be set far enough in advance that the clients cannot rely on these forecasting means to determine the likelihood of an insurance payout. If clients can forecast a weather event in advance of the sales closing date clients will only purchase if they feel a triggering event is likely. As mentioned earlier, this was a major problem for a U.S. drought insurance scheme in 1988. An insurance product would need to be sold well before reliable forecast information become available. For all insurance products sales closing dates must be set far enough ahead to prevent adverse selection problems or to offer dynamic pricing where the premium rate increases as more information becomes available about the likelihood of an event. For example, in Peru, a rise in sea temperatures predicted the onset of an ENSO (El Niño Southern Oscillation) event seven to eight months before it occurred. In Mongolia, summer pasture conditions give some indication about the vulnerability of livestock in the coming winter so the sales season must occur 9 months ahead of the period of coverage. The time between the sales season and the coverage period may be a deterrent to potential clients with a shorter planning horizon and inconsistent cash flow.

In other settings, weather events are cyclical so that weather events in one year provide information about the likelihood of an occurrence in the next year. Again in Peru, in the historical data, El Niño events have not been consecutive. So following an El Niño year, demand for the insurance could be very low. An alternative would be to have multi-year contracts. Another alternative would be to sell options for the right but not the obligation to purchase insurance. This option contract would be cheaper than paying insurance premiums. These alternatives may not be ideal for lower income countries as convincing money-strapped households to commit to multi-year contracts or purchase insurance options may be very difficult, particularly for a new product. Research and piloting are needed in this area.

Contract Structure

Careful consideration should be given to how the insurance contract is structured. In fact, failure to understand the structure of the insurance contract is one of the key reasons farmers site for choosing not to purchase insurance (Giné, Townsend, & Vickery, 2007). Some products have complex structures that reduce basis risk by using a combination of indexes to determine losses. However farmers' concerns regarding basis risk does not seem to be significantly reduced by these more complex contracts. It is unclear if these increases in basis risk outweigh the sacrifices to transparency and flexibility of simpler contracts.

Simple contracts offer several benefits over more complex contracts. Simple contracts tend to be based on a single index and may cover several types of crops. For instance in India, BASIX moved from a crop-specific complex contract to a generic contract that is simple, straightforward, and covers all types of crops.

Simple contracts have several benefits over more complex contracts.

1. They are much easier to understand for clients and insurers. This has the advantage of simplifying the education process and reducing paperwork for insurers and clients alike.
2. They provide a better fit with inter-cropping systems, approaches where divide their land among several types of crops.
3. These contracts often allow smallholders to choose the periods of production they would like to insure. For instance, BASIX uses a 3 phase payout structure and farmers may choose to purchase coverage for any or all of these phases.
4. They allow for more flexible farming systems. For example, farmers may change their production strategy or crop portfolio based on emerging weather conditions

5. These contracts can easily be applied to non-farm activities that are also affected by weather risk.

Meteorological Infrastructure, Data Availability and Data Quality

Appropriate meteorological data remains vital to the success of index insurance products. Adequate data must exist to assess and price the risk. Quality real-time data and sufficient density of data stations is also needed to estimate losses and minimize basis risk. As in the case of the Ethiopia project, a lack of metrological infrastructure will limit the number of clients for which an index can be used reliably to underwrite risk. In the case of India, a successful pilot and scale up has spurred private and public investments improved meteorological infrastructure. The private sector weather data market is even emerging in response to the demand for this information from insurers and government. Still, a lack of adequate meteorological infrastructure has constrained further program expansion in India. In Mexico, the expansion of an index insurance contract of FONDEN has been limited by inadequate and low-quality weather-station infrastructure. *Furthermore, putting many ground-level weather stations into service may be expensive and offset many of the advantages index insurance.*

Adequate data availability is needed to protect insurers and reinsurers as it helps them price and monitor insurance products. Reliable, affordable, and secure data systems are needed to expand index insurance projects. Increasing the number of weather stations in many countries and regions would be a very costly investment.

Alternative data systems that reduce basis risk and data costs are being explored. Satellite data represents a promising low-cost alternative to weather-station data for index insurance. Satellite rainfall estimates originated in 1980 and have become increasingly more accurate over time (Dinku et al., 2007). Insurers and reinsurers tend to require 30 years of historic data for pricing insurance products, and this level of historic data is now emerging. Also, merging satellite data with weather station data may be possible for longer-term historic records.

Satellite data has several benefits beyond lower costs than weather station data. First, unlike weather stations in some areas, satellite data is real-time data that can track emerging weather trends as they occur. Second, satellite data is more inclusive than weather station data and has the potential to lower basis risk. Weather stations provide data at particular points. The conditions close to the weather station are extrapolated from these measurements. Satellite data is spatially continuous and can provide actual measurements for these points between weather stations.

Using satellite imagery to underwrite index insurance is still considered experimental; however, this data is used consistently in other outlets and has been proposed for use in upcoming pilot projects. Research and piloting regarding using satellite data is still needed. Synthetic Aperture Radar (SAR) is demonstrating some significant potential as this technology penetrates cloud cover and, with the proper models, can provide localized estimates of soil moisture as well as a clear image for identifying water inundation from flooding. The World Bank is researching use of SAR images for flooding. This work could involve use of real-time data that would enhance the ability to insure floods with index insurance. This would be a highly significant accomplishment as flooding impacts many regions of the world with little or no insurance. Floods impact agriculture as well as many other sectors. Floods also destroy assets.

Delivery Channel

The transaction costs of insurance must be reduced to facilitate the development of financial markets in rural areas of developing countries. Paying agents to sell insurance and deliver payments in remote areas can be expensive. These costs increase the price of insurance. For the poor to afford insurance products, low-cost delivery mechanisms are needed.

In terms of providing low-cost delivery mechanisms, two strategies have been used with some success. Both rely on networks with pre-existing connections to rural households. First, governments can distribute insurance benefits to rural households. Mexico's index insurance contract for FONDEN, a disaster relief program, is an example of this strategy. In this arrangement, the index insurance contract is written at the macro level with the government as the beneficiary. Governments such as Mexico have designed specific plans for who will receive support from these insurance payouts and how those funds will be delivered. Preparation like this provides accountability that increases the likelihood that the poor will receive the planned benefits in a crisis.

Second, stakeholders at the meso level can distribute benefits to rural households. Pre-existing networks also have a comparative advantage for delivering insurance products. Several arrangements are possible. MFIs and other lenders have had success linking lending to insurance. Some MFIs offer households the opportunity to pay for insurance by taking out a loan with slightly higher interest to pay for insurance premiums. Self-help groups can be written as the beneficiary of an insurance contract. In this arrangement, smallholders pay premiums to the self-help group, and in the event of an insurance payout, the group provides payouts based on a pre-specified arrangement. Also, intermediaries in the agribusiness value chain may deliver insurance services to smallholders. Stakeholders on the input side of the value chain, such as seed companies, have included insurance coverage with the products they sell to smallholders (Hess & Syroka, 2005). On the output side, some stakeholders, such as processors, already provide credit to smallholders and could extend this arrangement to include insurance coverage. The natural connections to rural households are what give these pre-existing networks an opportunity for delivering insurance services at lower costs to remote communities.

One risk for using a meso-level pre-existing networks is that there may be no official legal or regulatory standards ensure businesses will pass insurance benefits along to the poor if that is the objective. It is possible households will fail to get the insurance benefits for which they paid. ("Middle men" already have bad reputations of taking advantage of poor households in many countries.) More research is needed to create legal and regulatory arrangements that protect smallholders in this scenario.

BASIX of India is an excellent example of effective delivery systems of this class of insurance products for small-scale households. There are several factors that may work to explain this success:

1. They have an extensive rural network in the poorest parts of India.
2. They are invested in a broad range of livelihood promotion services.
3. They have won the trust of households through reliable business practices.
4. They rely on a strong and efficient business model that increases efficiency through feedback loops, MIS, etc.
5. They have a history of investing in human capital in rural areas.
6. They honor the dignity and freedom of poor households.

Additionally, BASIX placed these products into a larger framework of trying to increase the sustainability of their client base. Thus, they likely made some strategic decisions to incur the high start up costs of putting this new product into their portfolio of services with a goal toward protecting their clients so that they would be viable customers for the longer term benefit of the BASIX organization.

Marketing and Education

Major marketing and education are needed to ensure the success of index insurance products. Effective marketing in lower income countries increases the familiarity of target clients with the index insurance product. Households in some countries report having had

negative experiences using insurance products in the past so differentiating index insurance from past insurance schemes may be an important goal for marketing initiatives. In Ukraine, a general distrust of insurers and a lack of previous relationship between sales agents and farm households seemed to undermine sales attempts to households.

Along with marketing education remains a key factor in the success of an index insurance product. In India, clients who did not understand the payout structure and how the index was measured were much less likely to purchase index insurance in India. In Ukraine, sales agents who were not properly educated regarding the advantages and disadvantages of index insurance products were much less likely to promote this product. Clients who do not have a good understanding of the product may become frustrated if the product does not serve the function they expected.

Overall, marketing and education are such vital components to a successful launch of an index insurance product that they will require substantial resources. Education should occur at many levels including for regulators, insurers, lenders, and households. Marketing and education should be core focuses for any partnership in developing index insurance products.

In regards to marketing and education, the use of pre-existing rural networks including self-help groups and MFIs (and other lenders) greatly increase the likelihood of success. MFIs have built relationships with local smallholders and have a vested interest in their success. Farmers report considering these individuals more trustworthy than insurance agents with whom they have never had previous contact. MFIs can educate smallholders regarding how index insurance might complement and enhance other risk management tools.

Self-help groups provide farmers with the opportunity to organize and learn from one another. Smallholders often follow the behavior of leading progressive farmers in their self-help groups in adopting new farming strategies. The endorsement of these trusted groups and individuals has a profound impact on local uptake. This has been an effective approach in Mongolia where herders look to the most respected herders in their community for their perspective on the insurance product.

In India, the BASIX network has been cited for much of the success of the rainfall insurance project (Manuamorn, 2007). BASIX borrowers were much more likely to purchase index insurance than non-borrowers, and their local contacts created opportunities for town meetings and other marketing opportunities that increased local trust in the index product and influenced product development (Manuamorn, 2007).

Projects have been successful in the absence of these pre-existing networks. For example in Mongolia, no pre-existing rural network was identified for selling index-based livestock insurance. Without these local connections, more resources must be devoted toward marketing and education.

Client Uptake

Client uptake is clearly affected by marketing and education implementation; however, other factors of product design affect the uptake and long-term viability of index insurance products.

- **Products must be affordable to clients**. Index insurance has quickly gained popularity because its structure yields lower administrative costs over traditional agricultural insurance; however, given constraints such as delivery costs, marketing and education needs, catastrophic weather financing, index insurance may still be unattractive to insurance markets without substantial support for research and development to address the challenges.
- **Cognitive Failure.** Individuals are much less likely to plan for low-probability, high-consequence risks. This cognitive failure is a known psychological phenomenon and affects the willingness of poor individuals to spend their limited income to cover these

risks. In fact, the poor tend to select payouts for relatively low liability levels and for smaller magnitude events. For example in Mongolia, herders tended to purchase insurance for moderate losses but for very low liability. Herders could choose between to insurance policies with the same premium, 1) a policy that paid indemnities beginning at 6 of county-level losses and covered 30 percent of total liability, 2) a policy that paid indemnities at 10 percent of losses for 100 percent liability. Herders tended to choose the first policy even though the second policy provided more catastrophic risk protection. Given this cognitive failure, it is unclear how long households will be willing to purchase index insurance if they do not experience large payouts within the first several years of purchasing index insurance. As mentioned before the renewal rate for farm household purchasing index insurance is lower than one would hope.

- **Basis risk.** Basis risk may prevent farmers from using index insurance to underwrite moderate losses. Basis risk is reduced for high-impact losses that affect a whole community; however, for moderate losses that affect only some of the individuals, basis risk is higher. In India, farmers have already experienced the problem of experiencing moderate losses from weather events that fail to trigger indemnity payments.

Even if products can be delivered to rural households through government bodies or pre-existing networks, cognitive failure and basis risk may continue to discourage the poor from purchasing index insurance in the long term. Since lenders, self-help groups, and value chain members have a vested interest in smallholders having catastrophic weather insurance, these intermediaries are motivated to provide incentives to smallholders that can increase uptake. This can be done by linking products to other services such as loans or input supplies. In some cases lenders have provided increased access to credit and lower interest rates to households with index insurance who might otherwise not be able to obtain loans for lack of assets. Self-help groups might provide discounts for other services to members who sign up for catastrophic risk coverage.

The Likely Future of Index Insurance

As index insurance evolves and more lessons can be learned from the accumulating experience, there are a number of issues that require attention to improve the applicability of these products to smallholder households in developing countries.

New Reinsurer

The IFC, EU, and PartnerRe have come together in a new project - the Global Index Insurance/Reinsurance Facility (GIRIF). This project has two components. The first is the formation of a new reinsurance company, IndexRe, specifically designed to focus on underwriting parametric risks (primarily earthquake, precipitation (mainly drought), flood, and windstorm). The second aspect of the project will be the GIRIF Trust Fund (GTF) which will provide technical assistance and other inputs to facilitate the successful introduction of index based insurance in Africa, the Carrabean, and the Pacific regions. This project has the potential to provide a significant demonstration effect that could lead to much more index based insurance becoming available in developing countries.

Delivery Channels

New delivery models are needed that reduce transaction costs to facilitate market development and support rural finance. Delivering products directly to smallholder households is difficult, though it is being done in several countries (India, Mongolia). Macro level applications can be used to provide a safety net for the poor; however these models may not encourage market development unless they are segmenting the risk with a role for the private sector. While there have been few applications of index insurance at the meso level, i.e., insuring an agricultural intermediary, this use of index insurance or linking index

insurance to lending should be investigated further as a means to lower product delivery costs while supporting rural finance or other rural enterprises.

Legal and Regulatory Improvement[15]

International regulatory standards for index insurance would be beneficial for developing countries that have no experience with index-based risk transfer products. Some countries may require technical assistance in reviewing and developing appropriate regulations that address index insurance, while some countries may need additional capacity building for their broader financial regulation. Having access to international standards on index insurance would provide these countries with a framework for development.

New regulatory considerations will also be needed for different types of delivery models. For example, where index insurance is linked to lending or other services the development of legal and regulatory guidelines that protect smallholders in arrangements that pass-through benefits from the intermediary to smallholders is needed. Governments cannot currently regulate self-help groups and other intermediaries who have informal pass-through arrangements with smallholders.

Alternative Indexes

To address the limitations of working with limited or poor quality weather data alternative measures are needed that will provide reliable index estimation and also facilitate reinsurance coverage of weather risks in developing countries.

Satellite and radar technology are rapidly improving and their coverage is expanding. Early satellite work was used to develop vegetation indexes to monitor pasture conditions and predict famine crises in pastoral Africa. This technology continues to advance in its ability to predict not only the amount of vegetation but also the quality. Newer technologies can be used to assess floods and drought. One such measure is the Water Requirement Satisfaction Index (WRSI). This index is an estimate of water stress that uses a ratio of water use to evaporative demand. This can be a more important factor for crop yield than rainfall estimates (Frere & Popov, 1979; 1986). Another alternative is estimating greenness of vegetation (Normalized Difference Vegetation Index) from satellite imagery. These data sources will likely need to be compared to and/or merged with other weather data to price index insurance products. More research is needed regarding how sensitive these indexes are to different climates and land use practices.

Climate Change Effects

Insurers and reinsurers like to price data based on 30 years of historical data because this length of time presents enough data to develop a probability distribution. Also, 30 years of data can elucidate trends in changing weather patterns. The Morocco case study highlighted how detrimental a trend such as declining rainfall can be on an index insurance product. Recognizing upcoming trends and pricing products accordingly remains a challenge for insurers and reinsurers. These changing trends can result in products being underpriced or overpriced over time; however, identifying an upcoming trend is very difficult as one or two extremely good or bad years will fall within the tails of a normal data distribution. Reinsurers often add a premium for this unknown risk that may affect the ability of local insurers to afford this coverage. Emerging climate trends and concern about increasing volatility of weather have already increased demand among the donor and research community for risk management tools to protect smallholders.

[15] Appendix C is attached to provide some perspective from the Mongolia case for why a composite loan and index insurance product might best be delivered by banks acting as agents for insurance companies. There are important market conduct issues that are outlined in this note.

Can Index Insurance be Linked to Climate Change Adaptations?

There is an emerging debate that is disturbing for the efforts to create markets for index insurance. The Kyoto Protocol on climate change references the use of insurance to aid in compensate for damage created by climate change and more extreme weather. There is a movement to link climate change, adaptation and index insurance together into an agenda that would argue that one mechanism that might be used by developed countries to compensate lower income countries is subsidies on index insurance. The line of reasoning is that to the extent that developed countries created the pollution that is leading to climate change, they should compensate those who are damaged. In this case, that is the developing countries that are likely to be exposed to more extreme weather events. However, the logic breaks down when it is also argued that subsidized index insurance would facilitate adaptation. Insurance is designed to encourage more risk taking behavior. If one subsidizes insurance, this aspect is exacerbated. Paying people to take more risk will almost assure that they will take more risk. If the goal is to get farm household to adapt to climate change, subsidized insurance is more likely to slow adaptation. Additionally, if the climate change is resulting in patterns of weather that cannot sustain existing farming systems, something more is needed. New technologies and assistance to encourage changing farming systems would be a much more effective way to facilitate adaptation. Finally, if the intent is to compensate for damage done, Insurance is a very poor compensation tool and subsidized insurance is even worse.

Does Addressing the Hindrances Yield Massification? If Not, What Else Is Required?

Addressing these hindrances should allow for a much broader expansion of index insurance; however, each of these problems represents a serious roadblock that will not be removed easily. Priorities must be set for how to implement and expand index insurance projects. This should be done from a long-term perspective that addresses several questions. How can index insurance help households smooth consumption during weather shocks? How does index insurance best fit into a broader risk management system that includes other tools? And how can index insurance help spur rural development? Taking these needs into consideration, a whole new approach is recommended, one that uses index insurance in the context of a larger developmental process.

Even with the successful pilot and massification experiences of BASIX in India, problems with marketing index insurance to households remain. A misunderstanding of index insurance contracts, concerns about basis risk, and cognitive failure seem to limit present and long-term uptake of index insurance. Additionally, other lower income countries will have neither the pre-existing networks that have proven to be so important for the marketing, education, and delivery components of index insurance in India. Executing these tasks without a supportive pre-existing rural network quickly challenges the feasibility of an index insurance program.

Elaborating on the development model presented earlier the steps below present a suggested approach for how to gradually build risk management markets in lower income countries. This approach starts with protecting intermediaries from correlated weather risks to support growth and investment in the rural sector. These products can then be structured to pass on the benefits to the clients to encourage smallholder households to invest in higher-return activities while guarding them against economic shocks. As the market for these products grows, interest from the private sector will grow and a wider variety of financial services should begin to emerge that serve the rural poor.

Separate attention is given to the use of index insurance as a social safety net by government or international organizations.

First Generation: Protecting Intermediaries

Meso-level intermediaries such as lenders, value-chain members, and self-help cooperatives present a viable alternative to households for targeting index insurance products. These institutions can pool independent risks, risks that affect single households, but they are still exposed to correlated risks affecting a whole community. Correlated risk exposure affects the way institutions provide services. For instance, lenders often restrict access to credit when exposed to correlated risk. Addressing the correlated risk exposure of meso-level intermediaries will likely bring quick and marked economic improvements that affect many households in rural communities. If lenders can protect their portfolios by purchasing index insurance from a reinsurer, they will be in a better position to extend loans to smallholders. In this scenario, lenders could increase access to credit, and often provide credit at better terms, for rural households. Also, stakeholders at the meso-level are more likely to have familiarity with insurance instruments than smallholders, thus requiring less education (Platteau, 1997). Key implementers include donors who will provide technical assistance services, reinsurers, government regulators, local lenders and other intermediaries. These stakeholders will begin the process of building important in-country human capacity and familiarity with index insurance products. This capacity building is vital to index insurance projects because in-country stakeholders must have the ability to continue to evolve the insurance product to meet client needs.

Second Generation: Pass-through Benefits to Smallholders

While this arrangement increases access to credit for smallholders, it does nothing to reduce *their* exposure to extreme weather risk. Weather risk affects the risk management strategies of households such that smallholders are more likely to adopt low-risk, low-return strategies that protect from some risks but limit opportunities for future wealth.

Therefore, index insurance products marketed to intermediaries but that provides more direct benefit smallholders should be introduced next. These second-generation index insurance products may be directly linked to lending or input supplies to lower delivery costs. At first, products may simply be a type of “loan insurance” that protects smallholders from the severe consequences of defaulting due to catastrophic weather events. Later, these products should provide more direct benefits including payments to help households cope with losses.

Providing the poor access to these financial services will allow them to more efficiently and effectively manage risk thus creating possibilities for smallholders to choose higher-risk, higher-return strategies that increase opportunities for future wealth. Reducing the risk exposure of smallholders may even have a synergistic effect on development in rural communities. As smallholders choose higher-risk, higher-return management strategies, they will increase farm investments resulting in increased demand for lending services and input supplies. These increased investments will likely result in growing yields. Lenders, input suppliers, and processors will grow to meet these demands and will likely provide a wider array of risk management tools that provide improved risk coverage.

Second-generation products will build on the education, experience, and regulatory foundation established for the first-generation product. Local lenders and government officials will be able to provide assistance in marketing and education because of their previous experience with index insurance products. Several pilots are experimenting with linking services and pass-through arrangements and monitoring and evaluating their progress will be important for future index insurance projects.

Third Generation: Marketing Insurance to Households

Finally, by removing catastrophic weather risk from local markets, new opportunities for insurance products will develop. Index insurance has a comparative advantage for high-magnitude correlated risks; however, more traditional forms of agricultural insurance are better suited for moderate losses that are less likely to affect a whole community because

traditional insurance is not as prone to basis risk. Arrangements that involve a blend of these products should eventually be available. For instance, an insurer might provide traditional agricultural insurance to a larger farm but reinsure his or her portfolio with index insurance. These instruments tend to be marketed toward larger and wealthier households and are intended to protect them from falling into poverty in the event of weather shocks. Even though this final step is not geared toward poor households, systems that prevent fall into poverty are as important as moving households out of poverty in the long-term. Also, establishing these markets for better off households allows for further expansion to poor households as new products are developed.

Government and Donor Contracts for Index Insurance

Improving government services is another potential use for index insurance that can complement the market-development approach outlined above. Index insurance can be used by governments, donors, and NGOs for immediate disaster relief funding or by governments to protect public assets. First, in the event of an extreme weather event, institutions often face food and capital shortages that slow disaster relief efforts. Governments and donors can insure their disaster relief programs by using index insurance. For example, FONDEN, a government department in charge of disaster relief in Mexico, has a drought insurance policy. Also, WFP has experimented with a drought insurance policy in Ethiopia. Drought, because it is a slow-onset event, is a useful weather risk to underwrite because payments based on rainfall can be made and relief arrangements can be put in place as the disaster is emerging.

Second, index insurance can be used by governments to underwrite public infrastructure. For example, Mexico also has an index insurance contract that underwrites roads for earthquake risks. In the event of a disaster these index insurance contracts have the potential to greatly relieve government budgets that may need to allocate resources to other pressing needs.

Index Based Livestock Insurance in Mongolia is the best example at present for illustrating complementary public and private services. This structure allowed moderate losses to be underwritten by the private sector and larger, catastrophic-level losses to be underwritten by the government. Given the limiting role cognitive failure regarding planning for catastrophic risk has played on household uptake, this type of public-private partnership may provide a useful structure that protects households from moderate and catastrophic weather risk.

Indications of Costs

Product development and implementation can be a process that takes several years to complete. The time frame and actual costs will vary dramatically depending on the specifics of the country and investments needed to design and support the product. Countries with relatively sophisticated legal and regulatory systems, an active insurance sector, and rural finance activity will require a shorter development period than countries without these features. India had many of these advantages, and the pilot was launched with limited technical assistance and in a very short time period. This was due in a large part to the sophistication of the market which allowed for direct involvement of the market from the early stages of product development (e.g., ICICI-Lombard was in a good position to take on these ideas quickly).

In contrast to India, developing index insurance in Mongolia required more time and investment. Five years passed between the initial feasibility work (2001) and the first sales of the pilot (2006). To be fair, the idea sat largely dormant until it was picked up again in 2004. Thus, it took roughly two years of work to develop all of the details for the pilot program and the World Bank loan, which provides contingent financing in the event of a major catastrophe. During these years, capacity building took place to improve the insurance sector and financial regulation, investments in data systems were made, and a unique risk financing arrangement was designed to accommodate the nascent financial sector. As the

pilot progresses in Mongolia it requires ongoing capacity building and technical assistance to build local knowledge and institutional capacity for long-term sustainability. These efforts are being supported by Government of Mongolia, the World Bank and other donors.

Suggested Core Requirements for Product Development Implementation

Additionally, several core requirements of product development must be included that will factor into costs. The amount of time and investment needed for each of these areas will vary by country depending on the sophistication and reach of existing financial markets.

Demand Assessment. Contract structure should be developed in terms of where the most demand might be for an index insurance product. This will depend on who currently is most negatively impacted by weather risk.

Legal and Regulatory Considerations. Discussions with insurance regulators regarding how index products fit into the current legal system are needed.

Product Design. Product design will be affected by who the demand assessment identifies as the beneficiary as well as the particular characteristics of the weather event being underwritten. Sound underwriting, including appropriate sales closing dates, is critical.

***Ex Ante* Risk Financing.** *Ex ante* risk financing must be established before index insurance products are sold.

Delivery Channels. Considerations regarding appropriate delivery channels are needed.

Monitoring and Evaluation. A feedback system that ensures continual accountability and the potential for improved products is needed.

The Role of Governments and Donors[16]

For long-term sustainability of insurance markets, it is best if the role of government is one of facilitator and not direct deliverer of insurance products. This role includes establishing an appropriate enabling environment and providing certain public goods. More specifically, a government or donor can support such things as:

- Improvements in the legal and regulatory environment;
- Improvements in data systems and data collection;
- Educational efforts about the use of weather insurance;
- Product development; and
- Access to global markets.

In some cases, governments or donor agencies may choose to provide financing for catastrophic losses as discussed below. In general, however, governments should not be in the business of providing insurance. In any case, governments should not provide direct premium subsidies, which undermine the incentives to private-sector insurance companies. Also, such subsidies generally favor wealthier farm households and thus erode poverty objectives. Even targeted premium subsidies rarely work as planned.

An example of a recent donor intervention

In early November, 2007, the IFC of the World Bank approved the initial capital for the establishment of IndexRe. IndexRe is a new reinsurance company with ties to PartnerRe. IndexRe will have access to a Global Index Insurance/Reinsurance Facility (GIRIF) to establish technical and intermediation capacity to reinsure weather and catastrophic event (CAT) risks using index or parametric triggers. IFC will be the executing agency for the GIRIF. The facility will be involved in many dimensions of market development for this new class of insurance in lower income countries.

Supporting Improvements in the Legal and Regulatory Environment

In many countries, governments do not consider the role that insurance markets can play in coping with exposure to weather risks. Instead, they tend to focus on the provision of government aid following an extreme weather event. The expectation of this aid among citizens reduces the demand for weather insurance.

Insurance is a highly regulated activity in all countries. Even if the index products are developed as non-insurance products, they will likely be subject to some form of regulatory control. A failure to consider the impact of the regulatory system and to obtain the necessary regulatory authorizations could result in the provision of the index insurance being unlawful and in the providers of the insurance, and possibly intermediaries, committing a criminal offence. Unfortunately, in many lower-income countries, laws and regulations are simply not in place to accommodate the development and use of these types of weather insurance products. Without proper contract law and enforcement, the market for these innovations will not develop.

Government and donor support can be quite helpful in getting technical assistance to lower-income countries to update their laws and regulations, making them consistent with international law to improve the chances of gaining access to global markets for risk transfer. Human capacity building within financial regulatory agencies is also a critical public investment.

In many lower-income countries, the legal and regulatory systems are not sufficiently developed to facilitate and regulate insurance contracts. Financial regulators may not have the capacity to regulate the special nature of weather insurance. Regulators must ensure that insurers' capital reserves are sufficient to meet potential claims, or that insurers have access to capital through reinsurance to handle extreme losses.

Insurance markets may be missing in lower-income countries because of a number of weaknesses in the enabling environment. Stable governments and contract enforcement procedures are preconditions for rural financial markets to work properly. It is also important to have an insurance regulatory body that understands the differences between various classes of insurance.

If an effective legal system is not in place, insurance contracts may lose validity. For example, it is not uncommon for insurance companies to refuse to pay valid claims simply because there is no effective oversight. This, however, can undermine public confidence and demand for insurance. On the other hand, insurers may be reluctant to sell policies if there is a possibility that the government could alter the terms of the insurance contract after the insurance is sold. If judges and lawyers do not have a good understanding of insurance law, insurers may be forced to make indemnity payments in excess of their obligations under the policy.

Supporting Improvements in Data Systems and Data Collection

In supporting the development of weather insurance markets, governments can have a direct and immediate effect by providing greater access to existing data. Data are critical to the development of weather insurance markets and they must be credible. The equipment involved in developing weather data must be reliable, accurate, and secure from any potential tampering, and professionals who work with the equipment must be trustworthy. Most governments have reasonably good systems for collecting weather data, but they are missing quality systems for archiving and sharing historic weather data. Even more troublesome, some countries do not view the collection of weather data using government resources as a public good. Rather, they view it as a profitable resource and consequently charge for access to the data.

Other types of information are also important in the development of weather insurance: for example, yield data and other information on losses caused by extreme weather events,

changes in land use and input use intensity, and records of past disaster management activities or infrastructure changes. Government can play an important role in facilitating index insurance by collecting, maintaining, and archiving data needed to develop index insurance for weather risks for public use and also for use by those with commercial interests wishing to develop innovative weather insurance products.

Supporting Educational Efforts about the Use of Weather Insurance

Potential users must be educated about the advantages and disadvantages of index insurance products. To increase the likelihood that information is presented in a balanced way and that sufficient investments are made in a broader educational effort for an untested product, public funds from governments and/or donors may be required. If insurance is not commonly available in the countryside, general education about insurance and risk management may be necessary. Index insurance policies are typically much simpler and easier to understand than traditional farm-level insurance policies. However, potential users may need help in evaluating how well the index insurance works for their individual risks.

Supporting Product Development

One of the challenges associated with private-sector development of new financial products is the ease with which they can be copied and replicated by others. This “free rider” problem discourages many companies from making initial investments in new product development, especially in underdeveloped markets. Thus, some level of government and/or donor support for product development can be justified. These investments should be targeted at feasibility studies and developing pilot tests of new products with the involvement of local private-sector partners. Every attempt should be made to ensure that the knowledge and technology for new product development will be passed on to local experts as soon as possible.

Supporting Access to Global Markets

Ultimately, access to global insurance and reinsurance markets is important for developing sustainable weather insurance instruments. In most cases, domestic insurance companies in lower-income countries lack the financial resources needed to withstand the large losses that accompany the significant adverse weather events that damage crops or assets. This is one reason why insurance for weather risk is not offered by domestic insurance markets. Access to external financing to cover large losses when they occur is critical for a solvent insurance market. Regulatory officials must understand how to establish rules and regulations that both facilitate access to global insurance and reinsurance markets and regulate how domestic insurance companies must protect their positions to enable them to make full payment of indemnities if there are significant losses. By doing so, a regulator can facilitate access to global markets. The regulator can also provide information about global markets to local stakeholders; change regulations to allow local companies to use these markets; and support locally appropriate product development, as discussed above. These tasks are clearly within a government’s regulatory and administrative spheres of influence and can aid in facilitating market development for weather insurance with relatively modest budgetary outlays. Governments should refer to international experience and best practice guidance to establish an appropriate enabling environment, provide public goods that support market development, and undertake any other interventions. Governments should be particularly cautious of pressure from narrow special interest groups for rule changes favorable to their causes.

Supporting Financing for Catastrophic Losses

Until a sufficient volume of business has been established, extreme losses for the insurance pool may need to be underwritten, perhaps through contingent loans from government and/or donors, until international reinsurers are willing to participate in the risk sharing of a new product. For example, the World Bank has a contingent loan for the Mongolian Index-

based Livestock Insurance Pilot. If losses for the insurance companies and the domestic reinsurance fund are fully exhausted, the World Bank loan can be accessed to make indemnity payments.

Another possible role for government or donors is to provide financing for low-probability, high-consequence events. Evidence suggests that those at risk tend to ignore the probability of the most extreme and infrequent loss events, but insurers do not ignore these events and consider the probability of such catastrophic losses when setting premiums. This creates a gap between what buyers are willing to pay and what sellers are willing to accept for protection against very infrequent but catastrophic losses. Governments can provide the financing in a number of ways that still provide incentives to domestic insurers to operate in a proper fashion.

Conclusions

Developing appropriate insurance products for the poor could have significant developmental impacts. The poor pay for risk in management decisions that involve low risk-low returns strategies. If insurance products that costs less than these implicit payments by the highly risk averse poor could emerge, this would improve the efficient allocation of resources and lead to a greater rate of technological adoption. Increasing empirical evidence is also demonstrating that lower income countries that have better developed insurance markets grow at a faster pace than those without these markets. This is consistent with the strong economic foundations for understanding why risk transfer for natural disasters fits into an economic development strategy.

Improved financial services for the poor are desperately needed. Thus, it is a laudable goal to work toward their development with innovations like index insurance for agricultural and natural disaster risks. Still, as this report demonstrates, there are many constraints and no general consensus regarding what should be done to advance developments for weather risk management. Effectively implementing and expanding index insurance programs will require strong collaboration among donors and public and private partners.

Index insurance must also be placed into a larger developmental context motivated by the goal to enhance access of financial services for the poor. The development model that we favor provides a new approach that begins with index insurance to get the big risk for weather events out of the way first; making weather index insurance available to rural lenders and those involved in the value chain for agriculture as a first step. These efforts focus stakeholders and enhance the needed dialogue to create new thinking about how to transfer weather risk using global markets. As the development of these macro and meso products advance, opportunities for microinsurance products will emerge. In some cases, these opportunities may emerge more quickly than in others. Educational, regulatory and data constraints will be major determining factors that influence both the timing and the order of the developments. With good networks for delivery and good data, microinsurance index products may be feasible quickly. In some cases, the cost of developing the needed data systems will simply be prohibitive. This is an important issue that is often overlooked in what many have written about the promise weather index insurance. Large Investments in enough weather stations to mitigate the basis risks for the more sophisticated index insurance products can negate the advantages of these products.

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Annex A: Microinsurance Centre Profile

Corporate Capability Statement

The MicroInsurance Centre is the only independent institution that is focused full time on actively promoting the partnership model of microinsurance. In this model, appropriate institutions are linked with regulated insurance companies to provide professional insurance products to the low-income market, while maintaining the risk where it belongs – with a regulated insurer. This method has proven to provide important risk management tools to low-income people, provide an important addition to the product line of intermediary institutions, and allow insurers to enter this market efficiently and profitably.

Microinsurance is now a topic of wide interest among insurers, donors, and intermediaries including microfinance institutions. It is critical that when these products are developed, they are done so in a responsible, professional, legal, and prudent manner. This is what The MicroInsurance Centre advocates through its writings and activities. In many ways, these activities and writings have set the agenda for microinsurance.

The potential for microinsurance is huge. As an example, in Uganda alone, one insurer, working through medium and large MFIs covers over 1.6 million lives, or about 7% of the total population of that country. In Bangladesh over a million are covered, as in Indonesia, and the Philippines. The programmes that the Centre is working with now, have the potential to cover several million more lives with life insurance, health care insurance, endowments and other long-term savings, as well as property cover and other insurances.

Since its inception as an initiative of MicroSave, The MicroInsurance Centre has worked on several levels to promote responsible microinsurance. These include Working with several action research associates from concept development to roll out and beyond with microinsurance products. We have conducted numerous case studies, and written extensively about lessons learned from these programmes. We have taken an active role in the policy dialog at the level of the Working Group on Microinsurance, and with insurers and regulators in numerous countries, as well as with donors. There is an active effort to disseminate this information through a series of Briefing Notes, a well used web site, speaking engagements, and trainings.

Key Personnel:

Michael J. McCord, President

The MicroInsurance Centre has on-demand access to two actuaries with specialties in microinsurance; marketing specialists; demand researchers; and an expert on health care quality. The Centre also has important strategic relationships with MicroSave, and Microfinance Opportunities.

The MicroInsurance Centre has proven and respected ability to manage all processes in the development and management of microinsurance products. Among the Centre's activities include the following examples:

Activities with formal Action Research Associates:

- Microcare (Uganda): Offer a comprehensive health care microinsurance product, third party administration, and health clinic staffing. Currently covering over 10,000 lives, they have transformed from NGO to a Uganda licensed insurance company. The MicroInsurance Centre has worked specifically with them on numerous issues including:
  - Pricing and risk management
  - Accounting
  - Donor sourcing
  - Management structures
  - Transformation from NGO to regulated insurer

- K-Rep/KDA/AAR Health Services (Kenya): Offer a comprehensive health microinsurance product whereby AAR Health Services (an HMO with a network of health care facilities) provides health care access through K-Rep Bank. They currently cover about 1,000 lives, and reasonably expect to cover 5000 in three years.
  - Premium setting activities directly with their actuaries
  - Negotiations with insurance partners
  - Product design
  - Process implementation
  - Product review and assessment
  - Pilot testing

- CARE / Gemini Life Insurance Company (Ghana): CARE instigated a process where currently Gemini Life is offering a life and endowment policy to the low income market (approximately 1000 lives in the pilot) through rural banks in Ghana. They reasonably expect to cover over 250,000 lives over the next 3 years.
  - Guided their product development process from concept to roll out including:
    - Process planning
    - Product design
    - MFI selection
    - Insurer selection
    - Negotiation
    - Institutional arrangements
    - Premium setting – working with their actuaries
    - Regulatory relations
    - Pilot test planning and implementation
    - Design of marketing products

- ICICI Bank (India): ICICI with their insurer partners are beginning the development process for a technology driven in-patient health care product.

Other Significant Interventions:

- Nepal: helped the CMF identify potential products and implementation strategies
- Jordan: worked with MicroFund for Women to develop a process for developing and implementing microinsurance products
- Peru: helped ACP to develop a strategy for developing microinsurance products
- Uganda, Georgia, Albania, India, Indonesia, Romania, Ukraine, and Azerbaijan: Country studies identifying potential for microinsurance investments
- India, Laos, and Indonesia: UNDP/Allianz/GTZ studies of potential for microinsurance
- Mexico: Assisted in insurance partner selection with Compartamos.
- Pakistan: Training and product development process development with Pakistan Microfinance Network.
- Georgia: Identified potential investment opportunities and conducted a major regional microinsurance symposium.
- Vietnam: Strategies to improve TYM microinsurance program
- Worldwide: Head of MicroFinance Network working group with members from over twenty countries.
- Worldwide: Conducted a major landscaping exercise identifying microinsurance programs, delivery channels, and regulatory environments for microinsurance within the 100 poorest countries.

Activities with the Donor Working Group on Microinsurance:

- Wrote several chapters of the book: “Protecting the Poor – A microinsurance compendium”
- Co-wrote “Preliminary Donor Guidelines for Supporting Microinsurance”
- Developed outline for case study project to identify good and “bad” practices in microinsurance.
- Chair of Operations sub-committee, and member of the Dissemination and Regulations Committees

Trainings:

- “Making Insurance Work for Microfinance Institutions”
  - March 2003 – ILO, Turin Italy
  - October 2003 – Kampala, Uganda
  - March 2004 – ILO, Turin Italy
  - November 2004 – Islamabad, Pakistan
- Microinsurance basics

- July 2005 – Boulder MFT, Turin, Italy

Web Site:

- www.MicroInsuranceCentre.org with over 8,000 sessions per month.

International speaking engagements:

Numerous

Publications:

- Briefing Notes:
  - BN1 “The Lure of Microinsurance: Why MFIs Should Work with Insurers”
  - BN2 “How Poor People Manage Risk”
  - BN3 “Making Microinsurance Work for Clients”
  - BN4 “An Example of Systematic New product Development for Life Microinsurance”
  - BN5 “Lessons from Health Care Financing Programmes in East Africa”
  - BN6 “Financial Risk Management Tools for the Poor”

- Manuals:
  - “Making Insurance Work for Microfinance Institutions: A Technical Guide to Developing and Delivering Microinsurance.” Craig Churchill, Dominic Liber, *Michael J. McCord*, and *Jim Roth*. (An ILO publication)

- Synthesis Papers:
  - “Global Microinsurance landscape study”
  - “The Supply of Microinsurance in East Africa”
  - “The Demand for Microinsurance in East Africa”
  - “Reducing Vulnerability: The Demand for and Supply of Microinsurance in East Africa”
  - “Health Care Microinsurance – case studies from Uganda, Tanzania, India, and Cambodia.”

- Case Studies:
  - Uganda
    - Nsambya Hospital Healthcare Program (comprehensive health care)
    - Microcare (comprehensive health care)
    - AIG Uganda (group personal accident)
    - CIDR (in-patient health care)
    - Kitovu Patients Prepayment Scheme (comprehensive health care)
  - Kenya
    - MediPlus (formal health management organization)

        - Community Health Plan (comprehensive health care)
    - Tanzania
        - UMASIDA (out-patient health care)
        - Poverty Africa (comprehensive health care)
        - Community Health Programme (medications and out-patient care)
    - India
        - Small Enterprise Women's' Association (life, in-patient health care, property)
        - Tata / AIG (Life)
        - MFIs and Microinsurance (several)
    - Bangladesh
        - Delta Life insurance Company (endowment)
        - Three health microinsurance programs
    - Cambodia
        - CIDR (limited acute and in-patient health care)
    - Philippines
        - CARD Mutual Benefit Association (life and endowment)
    - Colombia
        - La Equidad Seguros (life)

- *Country experience of MicroInsurance Centre key personnel:*

Albania, Azerbaijan, Bangladesh, Bolivia, Botswana, Cambodia, China, Democratic Republic of Congo, Egypt, Georgia, Ghana, India, Indonesia, Jordan, Kenya, Laos, Malawi, Mexico, Morocco, Mozambique, Namibia, Nepal, Pakistan, Peru, Philippines, Romania, South Africa, Sri Lanka, Tanzania, Uganda, Ukraine, and Vietnam.

Languages fluently spoken by key personnel:

English

Languages fluently spoken by adjunct personnel:

English, French, Spanish

Contact:

Michael J. McCord, President

The MicroInsurance Centre, LLC

1045 N. Lynndale Drive, Suite 2E

Appleton, WI 54914

Annex B: GlobalAgRisk Company Profile

The mission of GlobalAgRisk, Inc. is to increase rural economic growth by developing efficient financial mechanisms for managing natural disaster and weather risks that affect the rural poor in lower income countries.

GlobalAgRisk, Inc. Principals
Dr. Jerry Skees, President
Ms. Anne Murphy, Vice-President

What We Do

Technical Consulting

GlobalAgRisk specializes in the design of innovative financial instruments for agricultural risk management and in legal and regulatory issues related to financial services in lower income countries.

Research and Development

GlobalAgRisk, headed by Dr. Jerry Skees, has published over one hundred articles and has helped shape the global community's vision of the nexus among catastrophic weather events, agricultural risk management, financial services, and economic development. Some of these publications can be found on our website www.globalagrisk.com

Educational Outreach

GlobalAgRisk provides educational outreach as part of its mission. Recent endeavors include developing a primer on index insurance for USAID, writing and proctoring a course on market-based risk management for the World Bank Institute, and leading a study tour of agricultural insurance in India.

Core Business Objective

To facilitate the development of financial markets that serve the poor in lower income countries

Increasing access to financial services in rural areas is seen as a key factor to helping people rise out of chronic poverty. However, catastrophic weather risks create serious constraints to increasing access to credit, savings, and insurance among poor households. Local lenders and insurers are simply unable to pool and manage these extreme risks on their own.

Two necessary factors must be tackled to address catastrophic weather risk. First, catastrophic weather risk must be transferred out of the affected community and region. This is most ideally done using reinsurance, an industry that manages major risks throughout the world. Second, this process must be affordable. High transaction costs have impeded the development of insurance markets in lower income countries in the past. GlobalAgRisk uses innovative insurance mechanisms to address this problem.

IBRTPs

GlobalAgRisk pioneered the term index based risk transfer products (IBRTPs) to define a class of financial products that underwrite risk based upon an index that serves as an indicator of losses, e.g.,

using a rainfall index to estimate crop losses. This structure lowers the cost of risk transfer because there is no need to adjust for individual losses.

Linking lending and insurance for transferring catastrophic weather risk out of communities can be critical to the success of local formal and informal finance. The idea of using banking and insurance together in a more structured form has potential to improve the efficiency of many market-based products that shift catastrophic weather risk out of agriculture. Our efforts in these projects and our search for better solutions that mix government and markets for the transfer of natural disaster risk in agriculture can be a key to economic growth and safety net policies for the poor.

Ongoing and Past Projects

Mongolia

Based on recommendations made with assistance from GlobalAgRisk, the World Bank and the government of Mongolia have developed a 3-year, Index-Based Livestock Insurance (IBLI) pilot that commenced in July 2005 in three provinces This pilot includes a government product addressing catastrophic livestock risk from harsh winter weather in the form of a Disaster Risk Product (DRP) and a commercial Base Insurance Product (BIP) that protects households from moderate losses. Indemnities are paid based on livestock losses at the county level. The DRP protects households for county-level livestock losses above 30 percent, and the IBLI protects households from county-level livestock losses between a trigger threshold of 6 percent or 10 percent and 30 percent.

Mexico

The Inter-American Development Bank working with GlobalAgRisk designed an irrigation insurance product targeting the enhancement of water markets by using risk management instruments to pay when there are extreme shortages of inflows of water to the reservoir. The consortium modeled the Rio Mayo system and developed a prototype product to demonstrate how ex ante financing could be used to facilitate water markets and potentially more equitable solutions for water allocation. Blending financial solutions with capital investments could add considerable efficiency to irrigation projects around the globe.

Peru

GlobalAgRisk, in partnership with COPEME, an association of microfinance institutions, and USAID worked to examine ways to hedge the portfolio risk on agricultural loans using weather index insurance. A primary weather risk in areas of Peru is extreme flooding from El Niño. GlobalAgRisk identified a strong correlation between an index of Pacific sea surface temperatures and ensuing El Nino events which can act as a proxy for losses. This consortium hopes that the rural poor will gain increased access to financial services if microfinance institutions can reduce their portfolio risk with El Niño insurance.

Vietnam

GlobalAgRisk is participating in an Asian Development Bank Project focused on developing suitable index insurance products that pay for rice losses from early flooding using objective measures that are highly correlated with flooding events. The project is concentrated exclusively in Dong Thap Province in the Mekong Delta. By indexing the river levels at the Cambodian border, the biggest indicator of downstream flooding can be identified and used to facilitate payments. The contracts would be written by primary insurers in Vietnam and sold to insurance companies, banks, and microfinance entities. This could then be used to facilitate loan-linked insurance products targeted at individual farmers. The idea of using satellite images to identify inundation on the surface is being advanced with the assistance of a World Bank team.

GlobalAgRisk History

Established in 2001 by Dr. Jerry Skees, GlobalAgRisk has been involved in numerous domestic and international projects involving agricultural insurance, natural disaster risk, and rural finance for the US Risk Management Agency, USAID, the World Bank, Inter-American Development Bank, and the Asian Development Bank, FIRST Initiative, in addition to several private sector clients. Professionals from

GlobalAgRisk have been involved in projects in Nicaragua, Argentina, Peru, Morocco, Mexico, Mongolia, Bolivia, United States, China, Brazil, Turkey, Romania, India, and Ukraine.

Strategic Professionals Working with GlobalAgRisk, Inc.

Dr. Barry Barnett, University of Georgia, United States
Dr. Roy Black, Michigan State University, United States

Subcontractors Available through GlobalAgRisk, Inc.

Dr. Mario Miranda, The Ohio State University, United States
Dr. Luis Gonzales, Monterrey Technological Institute, Mexico
Mr. Jason Hartell, United States
Mr. Andrea Stoppa, Italy
Dr. Akssell Leiva, Nicaragua
Ms. Lucia Ona, Ecuador

Jerry Skees

President of GlobalAgRisk, Inc.
1008 South Broadway, Lexington KY 40504

H.B. Price Professor of Agricultural Policy and Risk
Department of Agricultural Economics
University of Kentucky, Lexington KY

jerry@globalagrisk.com

Select International Experience: Donor Financed Projects on Agricultural Insurance

Lead Consultant and Project Leader for Pilot Projects and Product Development

2005–Current	Asian Development Bank	Vietnam: Flood Insurance in the Mekong Delta, Team Leader of the economic assessment and feasibility study and developing the flood insurance for Dong Thap Province
2001–Current	World Bank and the Government of Mongolia	Mongolia: Index-based Livestock Insurance, Chief Consultant to the Government of Mongolia; developing the pilot for the first ever Livestock Index Insurance; premium rate making; education; and other ongoing advisory activity
2004–2006	USAID	Peru: ENSO Insurance to Spur Lending to Small Farmers, Team Leader, obtaining approval from the Peruvian government for the first ever ENSO Insurance product

Feasibility and Economic Evaluation Consultant

2006–2007	World Bank and FAO	China: Macro Policy for Agricultural Insurance
2004–2005	Inter American Development Bank	Mexico: Irrigation Insurance in the Rio Mayo
2004	World Bank	Ethiopia: Investigating Institutional Arrangements for Sharing Weather Risk
2003	World Bank	India: Review and Recommendations for India Crop Insurance
2002	World Bank	Turkey: Developing a Research Agenda for Agricultural Insurance
2002	World Bank	Ukraine: Review and Recommendations on Crop Insurance
2001–2002	USAID	Romania: Alternatives for Financing Catastrophic Yield Risk
2000–2001	World Bank	Mexico: Review and Recommendations on Crop Insurance
2000–2001	World Bank	Morocco: Investigating Weather Insurance
1999; 2001	World Bank	Argentina: Policy Alternatives for Crop Yield Risk
1998–1999	World Bank	Nicaragua: Using Rainfall Insurance for Crop Yield Risk

Select Underwriting and Actuarial Expert Reviews for the Risk Management Agency, USDA

2007	Sugarcane Group Risk Plan
2007	Oyster Group Risk Plan
2005	Crop Insurance Premium Reduction Plans
2004	Portfolio Analysis, Indicators for Evaluating Performance
2004	RMA Plan for Projects on Rangeland and Pasture
2002–2004	Review of FCIC Portfolio and Retreat with Board of Directors
2003	Puerto Rico Coffee Tree and Production Insurance
2003	Cost of Production Insurance Plan for Cotton
2002	Livestock Insurance
2002	Cost of Production
2001	Crop Revenue Cover for 2002
2001	Adjusted Gross Revenue Insurance

Select Private Sector Consulting

2005	LightYear Capital	Advising on acquisition of a major crop insurance company

2004	ACE Insurance	Advising on insurance for an agricultural processor
2002–2004	American Clean Water	Investigating insurance for reducing environmental risk
2001–2002	Aquila Inc., Kansas City	Working on weather markets for agricultural risk
2001	PartnerRe, Zurich	Brazil: Evaluation of area-yield index insurance

Select Honor and Awards

2007	University of Kentucky	Great Teacher Award
2006	World Bank	The World Bank Mongolian Project won the Golden Plough Award for Most Innovative Project
2005	University of Kentucky College of Agriculture	T.P. Cooper Outstanding Research Award
1998	American Agricultural Economics Association	Quality of Communication Award

Education

Ph.D.	1981	Agricultural Economics, Michigan State University
M.S.	1977	Agricultural Economics, University of Kentucky
B.G.S.	1975	Political Science, University of Kentucky

Representative Publications

Skees, J. R., and B. J. Barnett. "Enhancing Micro Finance Using Index-based Risk Transfer Products." *Agricultural Finance Review* 66(2006): 235–50.

Barnett, B. J., J. R. Black, Y. Hu, and J. R. Skees. "Is Area Yield Insurance Competitive with Farm Yield Insurance?" *Journal of Agricultural and Resource Economics* 30(2005): 285–301.

Skees, J. R., P. Varangis, D. Larson, and P. Siegel. "Can Financial Markets Be Tapped to Help Poor People Cope with Weather Risks?" *Insurance against Poverty*. S. Dercon, ed. Oxford: UNU-WIDER Studies in Development Economics, Oxford University Press, 2005.

Skees, J. R. "A Role for Capital Markets in Natural Disasters: A Piece of the Food Security Puzzle." *Food Policy* 25(2000): 365–78. Reprinted in *The Economics of Natural Hazard: The International Library of Critical Writings in Economics*. Kunreuther, H., and A. Rose, eds. Cheltrenham, UK: Elgar Reference Collection, 2004.

Skees, J. R., and B. J. Barnett. "Conceptual and Practical Considerations for Sharing Catastrophic/Systemic Risks." *Review of Agricultural Economics* 21(1999): 424–41.

Annex C: Banks as Agents for an Insurance Company

Note for the Financial Regulatory Commission of Mongolia

Regarding the Issue of Having Banks Act as Agents for Insurance Companies

Drafted by Richard Carpenter, Legal and Regulatory Consultant to IBLIP

Introduction

The Index-based Livestock Insurance Project [the Project] proposes the introduction of a new "bundled" product to be sold to herders by participating banks. The bundled product will combine a loan with an index-based livestock insurance policy [IBLI policy]. The bundled product would be sold in just two of the pilot Aimags in the first year.

The IBLI policy, although not credit insurance, would provide herders with the means of paying back their loan, or part of it, in the event of a dzud that causes livestock loss sufficient to trigger a payment.

The bundled product will have a number of benefits, including the following:

1. As the IBLI policy will mitigate some of the bank's risk that herders will default on the repayment of their loans in the event of a dzud, this should enable the banks to provide access to more credit and loans at a reduced rate of interest.

2. The costs of selling the IBLI policy as part of the bundled product will be less than the cost of selling the product through the normal agent system. This is because the IBLI policy will be sold to herders at the same time as the loan when the herder visits the bank. There will be no need for agents to visit herders. The reduced costs should result in lower commission paid to participating banks which should be passed on to the herder through a reduced premium.

3. Creating a dual delivery system with the already established agent system and the proposed new delivery system for IBLI should enable more IBLI policies to be sold.

It is proposed that the MDF Project will offer banks that agree to sell the bundled loan/IBLI insurance product access to a reduced cost wholesale lending facility which could be drawn on by the banks to make the herder loans.

Sale of IBLI Policy as Part of Bundled Product

An insurance policy can only be sold in Mongolia by:

- an insurance company; or
- an insurance agent.

In addition, an insurance broker can arrange for the sale of insurance to his client.

Insurance company staff are not involved in the direct sale of IBLI policies and all sales will therefore have to be made by insurance agents, or arranged by insurance brokers, licensed by the FRC and certified by the Project Implementation Unit [the PIU].

Subject to the relevant laws and regulations, the possible arrangements are:

1. The IBLI policy could be sold by the participating bank acting as the agent of the insurance company.

2. The IBLI policy could be sold by an employee of the participating bank, for example the loan officer or the soum branch manager, acting as the agent of the insurance company.

3. The sale of the IBLI policy could be arranged by the participating bank acting as an insurance broker on behalf of the herder, as his client.

The Project team has carefully considered the options and concluded that for the purposes of the Project, the regulatory risks would be unacceptably high unless the IBLI insurance policy can be sold by participating banks as agents for the insurance company.

The Project team is aware from its international experience that banks are authorised in many countries to act as insurance agents and that this would be in line with international best practice.

Insurance Agents/Insurance Brokers

Most jurisdictions recognise the different roles of insurance agents and insurance brokers. The International Association of Insurance Supervisors defines “insurance intermediary” as any natural person or legal entity that engages in insurance intermediation.

The IAIS definition explains that intermediaries are usually divided into “independent brokers”, who represent the buyer in dealings with the insurer and “agents” who represent the insurer.

As recognised by the IAIS, the key difference between an insurance broker and an insurance agent is that:

- an insurance broker acts for the purchaser of insurance;
- an insurance agent acts for the insurer.

The role of an insurance broker is to assess the insurance needs of his client (the person seeking insurance) and using his professional knowledge to advise his client on the appropriate insurance for him. The insurance broker owes his duty to his client, i.e. the person seeking insurance.

An insurance agent acts for an insurer and owes his duty to the insurer. An insurance agent can act for one or more insurers.

Banks as Insurance Brokers

The Project team considers that, in selling the IBLI policy, a participating bank could not act as a broker as this would be incompatible with the function that it is carrying out. The bank would, in effect, be acting solely as a sales agent. The bank would not assess the herder's insurance needs and would not provide the herder with insurance advice.

Furthermore, as the bank would also be providing a loan to the herder, the bank has an interest in the transaction that would conflict with the independent role of a broker.

In the Project team's experience, banks are not generally authorised to act directly as insurance brokers in other countries.

Finally, even if a separate company was to be established by a participating bank to act as a broker, given the linked nature of the loan and the IBLI policy, the team still considers that there would be a conflict of interest.

International experience and the circumstances of this Project have therefore led the Project team to conclude that it would not be appropriate for banks to sell IBLI policies as part of a bundled product as insurance brokers.

Insurance Intermediaries Law

The Insurance Intermediaries Law provides in Article 3.2.2, that an insurance agent is a "legal or natural person". Although Article 12.1 of the Law provides that only companies are eligible to apply for and hold a license as an insurance broker or loss adjuster, there are no similar limitations on persons who may apply for or hold a license as an insurance agent.

In the circumstances, there appears to be nothing in the Insurance Intermediaries Law that would prevent a bank, as a legal person from being licensed as an insurance agent.

However, the FRC has recently issued a regulation that specifies that only an individual may be licensed as an insurance agent. This Regulation would prohibit a bank from acting as an insurance agent for the purposes of the bundled product.

Project Proposal

The Project requests the FRC to consider granting banks an exemption from the recent regulation so that, for the purposes of the pilot project only, banks can be licensed and certified as insurance agents. The reasons for this are set out below.

Market Conduct Risk

It is important that IBLI policies, when bundled with a loan, are sold appropriately. There are a number of market conduct issues which the Project team is aware of. These arise principally because the interests of the banks and the herders are different and, as the herder needs a loan, 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 cover than he needs [i.e. by refusing to grant the loan unless the level of cover determined by the bank is taken]. A bank has two principle interests in the sale of BIP as part of a bundled product:

- Ensuring that the amount of the loan is fully covered by the BIP policy taken out by the herder; and
- Earning the maximum amount of commission.

The herder, depending upon his individual circumstances, may require a different level of cover than that required to repay the loan which, as indicated above, could be a higher or

lower level of cover. The herder may not even need BIP insurance at all or may wish to purchase BIP cover from an independent agent and should not be pushed into purchasing the bundled product when all he wants is a loan. It must be accepted that, by not taking BIP cover, the herder would have to pay a higher rate of interest for the loan and may even fail to satisfy the bank's reasonable lending criteria, but that is a different issue.

Of course, independent agents also have an interest in maximising their commission but they are not in a position to exercise excessive influence on herders as the banks are.

The loan officer, if acting as an independent agent, would also be interested in maximising his commission and, as the individual primarily responsible for approving the loan, would be able to use his official position [by approving or refusing to approve the loan] to influence the herder to purchase BIP, or a level of BIP, such that his commission as an individual agent is maximised. Where an employee has a strong personal, and independent, incentive to exercise the powers of his employee is a certain way, it is notoriously difficult to protect against the abuse of those powers.

In order to protect herders, it is therefore essential that the PIU establishes market conduct principles which would have to be followed by banks when designing their procedures for the sale of the bundled product. These principles would, for example, require participating banks to treat their customers fairly and to be transparent, for example as to the commission they are receiving. In order for these procedures to be effective, they would have to apply to the bank's loan officer when selling the bundled product as a whole, i.e. including the loan and the BIP. It is clear that, when acting as an employee of the bank, the loan officer is fully subject to the bank's procedures. Therefore, if the Bank was to be the agent, the loan officer would have to apply the bank's procedures with respect to the granting of the loan and the sale of the BIP. However, if the loan officer acts as an independent agent for the purposes of selling the BIP part of the bundled product, whilst he would be subject to the bank's procedures with respect to the loan, he would not be subject to the bank's procedures with respect to the sale of the BIP.

This is highly unsatisfactory for many reasons, including the following:

- The bundled product is intended to be a composite product and the same procedures should be applied to the sale of the loan and the IBLI policy
- A participating bank would have no control over its loan officers with respect to the sale of the BIP and it would be much easier for the loan officer to abuse his position
- If the bank is the agent, the FRC and PIU will need to regulate and supervise the market conduct of participating banks, but not the loan officers. The loan officers, as the Bank's employees, will be the responsibility of the participating banks. If the loan officers engage in the miss-selling of BIP, it is the Bank's license that is at risk – a strong incentive for it to supervise its loan officers. If the loan officers sell BIP as independent insurance agents, the FRC and the PIU will have to regulate and supervise them on an individual basis. This would be an impossible position for both the FRC/PIU and the participating banks
- Different employees in the same bank, and even the same branch, could adopt different procedures for the sale of loans and IBLI policies, leading to unacceptable inconsistencies

Many banks and insurance companies have developed associations. If a loan officer sells BIP as an independent agent, it would be possible for him to agree to act as the agent of a different insurer. This would be unsatisfactory for the banks and would risk creating a rather confused situation. It would also be unsatisfactory if it encouraged insurance companies that do not have an association with a bank to compete for loan officers to act as agent

In summary, there is a fundamental inconsistency in the positions of employee and independent agent and to permit loan officers and other employees of a bank to have this dual function would create a significant regulatory risk.

Annex D: People contacted during the research

Name	Organization	e-mail	Position/ area of expertise
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