Insuring Against Drought-Related Livestock Mortality:
Piloting Index Based Livestock Insurance in Northern Kenya

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Abstract

Climate related shocks are among the leading cause of production and efficiency losses in smallholder crop and livestock production in rural Africa. Consequently, the identification of tools to help manage the risks associated with climactic extremities is increasingly considered to be amongst the key pillars of any agenda to enhance agricultural growth and welfare in rural Africa. This paper describes the application of a promising innovation in insurance design – index-based insurance – that seeks to bring the benefits of formal insurance to help manage the weather-related risks faced by rural crop and livestock producers in low-income countries. In particular, we highlight the research and development agenda of a comprehensive effort to design commercially viable index-based livestock insurance aimed at protecting the pastoral populations of Northern Kenya from the considerable drought-related livestock mortality risk that they face. Detailing the conditions that make the pastoral economy in Northern Kenya an ideal candidate for the provision of index-based insurance products, the paper describes the contract design, defines its structure, offers analysis that indicates a high likelihood of commercial sustainability among the target market and describes the process of implementation leading up to the launch of a pilot in Marsabit district of Northern Kenya in early 2010.

1. Introduction

Downside-production risk is a considerable constraint to agricultural production and development whose impact is particularly felt by small-holder farmers and livestock keepers whose meager resource base offers them with few effective options to manage this risk. As is true in most of rural Africa, thin markets, poor physical and institutional infrastructure and weak access to credit and savings markets compound the problem of production risk that poor farmers and livestock keepers face.

Climate extremities are the greatest source of agricultural production risk with droughts and floods resulting in total or partial crop failures as well as forage and water scarcity that reduce livestock productivity and, in severe cases, lead to widespread livestock losses (Thornton et al. 2008; Hellmuth et al. 2007; IPCC 2007). Over the past decade or so, natural disasters, particularly droughts and floods, have risen sharply worldwide with the biggest increase in low-income countries whose disaster incidence rose at twice the global rate (Tebaldi et al. 2006; IFRCRSC 2004). In much of rural Africa, where water harvesting, irrigation and other similar water management methods are under developed and the impacts of climate change are expected to be especially pernicious, managing agricultural production risk becomes increasingly important (Thornton et al. 2008; Hellmuth et al. 2007).

The increasing recognition of the considerable risks faced by the smallholder agricultural sector and the non-trivial impact of these risks on agricultural growth and rural welfare have placed a spotlight on risk and lifted the management of risk to a place of priority with regards to interventions to catalyze agriculture in rural Africa (World Bank 2005; Barrett et al. 2007a). Consequently, the past several years have seen the development of innovative interventions for managing weather-related agricultural risk. Of these, index-based insurance products represent a promising and exciting market-based option for managing climate related risks that vulnerable households are exposed to.

The creation of insurance markets for events whose likelihood of occurrence can be precisely calculated and associated to a well defined index is increasingly being championed as a way by which the benefits of insurance can be offered to relatively poor and remote populations (World Bank 2005; Barrett et al. 2007b; Skees and Collier 2008; Skees et al. 2006; Hellmuth et al. 2009). Index-based insurance holds considerable appeal for both commercial and development purposes because it allows for management of covariate risk – particularly those related with weather fluctuations – and avoids the serious adverse selection and moral hazard problems that have long plagued conventional crop and livestock insurance programs throughout the world.

This paper underscores the potential of index based insurance to manage weather related risk faced by rural farmers and livestock keepers by highlighting a comprehensive effort to catalyze a

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commercial market for index-based livestock insurance (IBLI) in Marsabit district of Northern Kenya. This IBLI product has many innovative features. It appears to be the first to develop the index insurance product from longitudinal household data so as to minimize basis risk in product design. It is one of the first developed to protect the productive asset holdings of the poor and vulnerable rather than just their income streams. It is one of the first to be based on more spatially distributed remotely-sensed vegetation data, rather than rainfall series from a sparse set of fixed point meteorological stations, as the IBLI index is derived from satellite-based normalized differenced vegetation index (NDVI) series that summarize the state of rangeland forage availability at high spatiotemporal resolution. Finally, IBLI Marsabit was designed to complement a new (unconditional) cash transfer program (the Hunger Safety Nets Program, HSNP) the government launched in the area and the IBLI impact evaluation design explicitly enables identification of the independent and synergistic effects of HSNP and IBLI as alternative means of addressing the risk and financial constraints faced by the poor.

In the next section we summarize the main principles of index-based insurance contracts. In Section three, we start by highlighting some of the key characteristics of Northern Kenya and its economy that make it particularly suitable for risk-management via index-based insurance contracts, then describes the various elements of the IBLI research and development agenda.   Section four profiles the key processes involved in the implementation and sale of IBLI and finally, Section five concludes.

2. Index-Based Insurance

Like any insurance product, index-based insurance aims to compensate clients in the event of a loss. Unlike traditional insurance, which makes payouts based on case-by-case assessments of individual clients' loss realizations, index-based insurance pays policy holders based on an external indicator that triggers payment to all insured clients within a geographically-defined space. For index insurance to work, there must be a suitable indicator variable (the index) that is highly correlated with the insured event. Using a data source that is promptly, reliably, and inexpensively available (and not manipulatable by either the insurer or the insured), an index insurance contract makes the agreed indemnity payment to insured beneficiaries whenever the data source indicates that the index reaches the "strike point," or insurance activation level.

For example, if one is insuring against livestock mortality, then rainfall or forage availability may be suitable indicators if drought or a shortage of forage, or a combination of the two, often result in above-normal livestock mortality. One could then write an insurance contract based on some statistically-specified function of a rainfall or forage indicator to protect against specified levels of

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aggregate livestock losses. The contract would specify its geographical reach, temporal (or seasonal) coverage, the strike level, and the relevant premium and payment terms.

An index-based insurance product has significant advantages over traditional insurance. Traditional insurance requires that the insurer monitor the activities of their clients and verify the truth of their claims. For relatively small clients in infrastructure-deficient environments like the northern Kenyan ASALs, the costs of such monitoring are often prohibitive. With index-based insurance products, all one has to do is monitor the index, thereby sharply reducing costs. Furthermore, by using an index based on variables that cannot be influenced by any insuree's behaviour, index-based insurance products overcome the key asymmetric information problems that plague traditional insurance contracts: that more (less) risk-prone individuals will self-select into (out of) the contract and that insured individuals have an incentive to take on added risk – phenomena known as "adverse selection" and "moral hazard," respectively.

These gains from index-based insurance come at the cost of "basis risk", which refers to the imperfect correlation between an insuree's potential loss experience and the behaviour of the underlying index on which the insurance product payout is based. Individuals can suffer losses specific to them but fail to receive a payout because the index does not trigger. On the other hand, lucky individuals may receive indemnity payments that surpass the value of their losses. While this problem cannot be completely eliminated, we have carefully designed the IBLI contract to minimize basis risk and therefore to maximize its value to the insured population.

2.1 Economic and Social Returns to IBLI for the ASAL

In Kenya's arid and semi arid lands (ASALs), drought is the most pervasive hazard, natural or otherwise, encountered by households on a widespread level. This is especially true for northern Kenya, where more than 3 million pastoralist households are regularly hit by severe droughts. In the past 100 years, northern Kenya recorded 28 major droughts, 4 of which occurred in the last 10 years. For livelihoods that rely solely or partly on livestock, the resulting high livestock mortality rate has devastating effects, rendering these pastoralists amongst the most vulnerable populations in Kenya. As the consequences of climate change unfold, the link between drought risk, vulnerability and poverty becomes significantly stronger.

In such an environment, the economic and social returns to an effective program that insures pastoral and agro-pastoral populations against drought-induced livestock losses can be substantial. To the extent that the likelihood of severe herd mortality reduces incentives to build herds, insuring livestock against catastrophic loss would address the high risk of investment in such environments. By

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thus stabilizing asset accumulation this should improve incentives for households to build their asset base and climb out of poverty, thereby enhancing economic growth.

One of the principle negative effects of a risky environment is that it depresses the development of financial markets that are a critical pillar of economic growth. Private creditors are often hesitant to offer uncollateralized loans particularly when borrowers' capacity to repay is closely tied to risk outcomes. In such an environment, financiers might become willing to lend if the assets that secure their loans could be insured. Livestock insurance, which can be used as collateral, can thereby potentially "crowd-in" much-needed credit for enterprises and individuals in the region without leaving creditors overexposed.

Finally, because it provides indemnity payments after a shock, livestock insurance could help stem the collapse of vulnerable-but-presently-non-poor households into the ranks of the poor following a drought (or related crisis) due to irreversible losses from which they do not recover. This is a particularly salient point given the increasing empirical evidence of behavioral response consistent with the presence of dynamic poverty traps among pastoralists of Northern Kenya (Barrett and McPeak 2005, Lybbert et al. 2004, McPeak 2001, Santos and Barrett 2006). Poverty traps manifest in the form of a dynamic herd size threshold above which herds accumulate to a high-level equilibrium and below which herds sizes naturally diminish to a low level equilibrium below the poverty line. For those with herd sizes slightly above this threshold, protecting them against losses that will naturally lead them toward chronic poverty is an important priority that IBLI could theoretically fill (Barrett et al. 2008; Chantarat et al. 2009b).

2.2 IBLI Design and Implementation Challenges

Despite the contractual advantages of an index based insurance product as well as the potential economic and social benefits, four major challenges confront the creation of an IBLI contract and ensuring a sustainable market for it:

- *High quality data* are required to accurately design and price insurance contracts and determine when payouts should be made.
- *Design of an optimal insurance index* that to the maximum extent possible reduces the risk borne by the target population so that the value and potential demand for the product are high;
- *Effective demand* for IBLI insurance among a target clientele largely unfamiliar with insurance in general and index-based agricultural insurance in particular; and,
- *Cost-effective ways of delivering* IBLI insurance to small and medium scale producers in remote locations.

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Given the promise of IBLI to manage the considerable drought-related mortality risks that pastoral and agro-pastoral populations face and the challenges associated with introducing a novel and relatively complex product to a remote and largely illiterate population, it was necessary to develop a comprehensive research and development agenda that would incorporate the design of a context-specific IBLI contract, examine the risk profile of the target population, explain the contract and coverage terms, elicit willingness-to-pay, and create the environment necessary for a successful pilot. The following section highlights some of the key activities undertaken within this agenda.

3. Developing IBLI for Northern Kenya

3.1 Overview of the Livestock Economy in Marsabit District

The value of an IBLI contract for underwriting risks depends on the role that risk plays within the target economy and how amenable it is to indexing. In other words, is it a risk that is largely covariate in nature, impacts a substantial number of the insurable population over a sufficiently wide spatial area, and is highly correlated to a readily observable and cheaply available non-manipulable variable that can serve as the index? These characteristics, which we sought as a precondition for a suitable pilot location, are found in the livestock economy of Marsabit District in Northern Kenya.

Northern Kenya's climate is generally characterized by bimodal rainfall with short rains falling October – December, followed by a short dry period from January-February, and long rains in March-May, followed by a long dry season from June-September. Pastoralists rely on both rains for water and pasture for their animals, as well as occasional dryland cropping. Pastoralism in the arid and semi-arid areas of northern Kenya is nomadic in nature, where herders commonly adapt to spatiotemporal variability in forage and water availability through herd migration.

Livestock represent the key source of livelihood across most ASAL households. As Figure 1 shows, when households are split across four categories – high and low cash income and high and low livestock holdings (where the threshold for high/low is determined by median value), only the low livestock, high cash households obtain less than 50% of their income from livestock.

The danger is that livestock face considerable mortality risk, rendering pastoralist households vulnerable to herd mortality shocks. Among these, drought is by far the greatest cause of mortality (Figure 2) and drought-related deaths largely occur during severe shocks, as during the rain failure of 2000 (Figure 3). IBLI is designed for precisely these instances of considerable loss. During times of relative normalcy, mortality arises relatively randomly due to non-drought related mortality causes such

as diseases and predators. Such losses can be self insured. IBLI is designed to cover those more severe shocks which pose a greater threat to livelihoods.

3.2 Design of the IBLI Contract

To design and appropriately price the IBLI contract itself, we had to find a measure that is (1) highly correlated with local livestock mortality; (2) reliably and cheaply available for a wide range of locations; and, (3) historically available to allow pricing of product.   The Normalized Difference Vegetation Index (NDVI) meets these conditions. Constructed from data remotely sensed from satellites, NDVI is an indicator of the level of photosynthetic activity in the vegetation observed in a given location. As livestock in pastoral production systems depend almost entirely on available forage for nutrition, NDVI serves as a strong indicator of the vegetation available for livestock to consume. Since the late 1980s, the United States' NASA and NOAA have used AVHRR data[1] to produce dekadal (10-day) composite NDVI images of Africa at a resolution of 8.0 x 8.0 km a day, and have built a valuable archive of these data from June 1981 to present, which are available in real time and free of charge.[2]

While NDVI has properties that make it reliable as the basis for an insurable index, it must also have value for the insured. In other words, NDVI data has to predict livestock mortality rates reasonably well.   We used household-level livestock mortality data collected monthly since 2000 in various communities in Kenya's ASAL districts by the Government of Kenya's Arid Lands Resource Management Project (ALRMP) to statistically estimate the relationship between NDVI measures and observed livestock mortality. To improve the contract and minimize the expected incidence of basis risk, we use panel data collected by the USAID-funded Pastoral Risk Management (PARIMA) Project quarterly from 2000 to 2002 (See Chantarat et al., 2009a for more details on data and product design).

Our current contract is based on Marsabit District, the pilot area. We combined these herd history data to create an optimal insurance index defined as the function of the NDVI data that is simple, replicable, commercially implementable and highly correlated with the herd mortality data so that it provides the maximum possible insurance value to the pastoralist population.

The key feature of the contract we design is a statistical predictive relationship between average livestock mortality within a specific area and the satellite based indicator of forage availability NDVI. Equation (1) presents a simplified version of the regression model we estimate to generate the key

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[1] The NDVI data we use is derived from data collected by National Oceanic and Atmospheric Administration (NOAA) satellites, and processed by the Global Inventory Monitoring and Modeling Studies group (GIMMS) at the National Aeronautical and Space Administration (NASA).The NOAA-Advanced Very High Resolution Radiometer (AVHRR) collects the data used to produce NDVI. Values of NDVI for vegetated land generally range from about 0.1 to 0.7, with values greater than 0.5 indicating dense vegetation.
[2] Further details about NDVI are available at http://earlywarning.usgs.gov/adds/readme.php?symbol=nd.

relationship underlying the IBLI contract[3]. The area average livestock mortality rate, M_{ls}, can be decomposed into the systematic risk associated with the vegetation index and the risk driven by other factors:

(1) $\qquad M_{ls} = M\left(X(ndvi_{ls})\right) + \varepsilon_{ls}$

where $X(ndvi_{ls})$ represents various transformations of the average NDVI observed over season *s* in location *l*, $ndvi_{ls}$. These transformations include standardized NDVI that presents deviations from the long-term average and also include cumulative standardized NDVI summed across various periods across the seasons prior to coverage. These transformations are intended to capture the unique dynamics of the pastoral production system whereby the nutritional health of livestock is not only dependent on current forage conditions but also the state of forage over the past couple of seasons. $M(\cdot)$ represents the statistically predicted relationship between $X(ndvi_{ls})$ and M_{ls}, and ε_{ls} is the mean zero, serially uncorrelated idiosyncratic component of area average mortality that is not explained by $X(ndvi_{ls})$ – i.e., location-specific basis risk. We predict area average mortality from observations of $ndvi_{ls}$, specific to each location *l* and season *s*, as:

(2) $\qquad \hat{M}_{ls} = M\left(X(ndvi_{ls})\right)$.

The response function represented by Equation (2) serves as the underlying index for the insurance contract.

As livestock mortality response to forage can vary due to different factors, it was necessary to divide Marsabit district into two clusters, each distinguished by its own response function, in order to improve precision of contracts. The two distinct geographic zones (Figure 4), which we term the Laisamis Cluster and the Chalbi Cluster were divided based on statistical cluster analysis, which bundles locations with similar characteristics, such as distribution of species within a herd, mortality rates and variables that may influence the predictive relationship between livestock mortality and NDVI. The

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[3] We present the modeled contract in simplified form and do not delve deeply into the key design issues. For a more detailed technical description and analysis, please see Chantarat et al. (2009a).

Chalbi cluster is drier and its herds have a higher fraction of camels and smallstock while in Laisamis cattle dominate.

The performance of the contracts can be analyzed by looking at how well the predicted mortality index corresponds to the actual area-averaged mortality in the target area. We present these results for both clusters and various insurance triggers in Table 1. Predictive relationships for both clusters maintain a high probability of correct trigger decisions. We define a correct decision as occurring when the model predicts mortality rates above the trigger and actual data shows that indeed mortality rates were above the trigger level. Correct decisions are also made when the model fails to trigger and actual mortality also did not register above the trigger. Where errors occur, they are quite well distributed between Type 1 (when beyond-strike loss is experienced but no payout is triggered) and Type 2 (payout is triggered when experienced loss is below the relevant strike) errors – the two components of basis risk. It is clear, however that contract performance generally improves the higher the strike. A balance must therefore be made between contracts that optimize performance and ones that covers a wider range of risk.

With the response function estimated, we then estimate the actuarially fair premium rate per season per value of TLU livestock insured for location l in season s covering the loss event that the predicted area averaged mortality index $\hat{M}_{ls}$ is beyond the mortality strike of M_l^* can be written as:

$$(3) \qquad p_{ls}\left(M_l^*\right) = E\left(Max\left(\hat{M}_{ls} - M_l^*, 0\right)\right)$$

where $E(\cdot)$ is the expectation operator over a distribution of NDVI based mortality index. The mortality strike M_l^* is the mortality level for location l, additional losses beyond which the contract will compensate for. The simplified pricing equation presented in Equation (3) above is the actuarially fair premium rate (%) per value of aggregate livestock insured. Table 2 reports the actuarially fair premium rates for contracts with various strikes across both clusters. Because the incidence of widespread mortality is higher in Chalbi than Laisamis, the fair premium rates are likewise higher there. As expected, the lower the strike level beyond which indemnity payments are triggered, the higher is the premium as compensation is more likely to occur.

3.3 Uncovering Client Interest and Demand for IBLI

In order to appropriately understand the target client's attitudes toward risk, to study their demand for insurance and conduct ex-ante impact assessments we conducted in-depth community and household level surveys among pastoralists in five communities in Marsabit district (Dirib Gombo, Karare, Logologo, Kargi and North Horr) chosen purposively to vary in terms of pastoral production system, market access and agroecology. The main objectives of the surveys were to (1) have full understanding of pastoralists' nature of livestock losses, their perceptions about risk of livestock loss and climate, (2) introduce potential clients to the concept of IBLI, and (3) investigate patterns and determinants of demand and willingness to pay for IBLI.

After an initial introductory focus group discussion with approximately 15-20 community members, we fielded a household survey in each location in which 42 households per location were randomly drawn using stratified sampling by wealth class. The household survey collected household level information, production data, risk profiles, the history of herd dynamics, perceptions about risk of livestock loss and other relevant information.

3.3.1 The IBLI Experimental Game

These households were later brought together to take part in an experimental game designed to replicate existing pastoral production systems, which we used to illustrate how index insurance would work and how it could be beneficial (Lybbert et al. 2010; McPeak et al. 2010a). Experience with other index-insurance pilots has shown that a carefully designed program of extension to appropriately educate potential clients is a necessary precondition to both initial uptake and continued engagement with insurance (Gine et al.,2007; Sarris et al. 2006). A prerequisite to generating demand and ensuring that the risk-management benefits of insurance effectively serve the client is for them to clearly understand the value of insurance and, in particular, how an index insurance product works.

In order to design an extension tool that adequately captures the complexities of the IBLI product, and relays the key features and terms of the contract terms, we took cue from the growing field of experimental economics. Experimental games offer a method by which complex concepts can be distilled and taught in a relatively simple manner, and dynamic decisions or processes can be easily repeated during game play to mirror the outcomes and elicit the behavioral response that could otherwise take years to understand.

A good experimental game that can impart important insights and lessons onto its 'players' needs to ensure that the simplified, abstract game mirrors the real world (in this case the actual features of IBLI contracts and their interaction with the pastoral production system) as much as possible. As such, we designed our IBLI educational game to replicate the nonlinear herd dynamics that livestock

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keepers in the rangelands face, as well as the basis risk intrinsic to IBLI and state-conditional indemnity payments only when an insurance premium was paid before the season began.

The games were very well received and in both their responses and questions in a sessions conducted after the games it was clear that the key intended lessons had been grasped: that, 1) One had to pay for insurance within the period of coverage to qualify for indemnity payments, 2) If premiums were paid but the strike to activate insurance was not attained, you were not entitled to your premium back, 3) Payments were a function of area average loss and not individual loss, and 4) Loss was determined by forage estimates derived from satellite-generated information. Nonetheless, while the games are arguably the most effective way to educate clients on the workings on an IBLI contract, they are also expensive to run and may not be cost-effective on a large commercial scale.

3.3.2 Soliciting Willingness-to-Pay

Having educated participants on the general structure of IBLI and how it works through the games, we then returned to each household for a follow-up interview where we sought to understand the determinants of demand for insurance as well as respondents willingness-to-pay for insurance at commercially sustainable rates (Chantarat et al. 2009c). To investigate this, sample households were asked to demonstrate their willingness to pay for IBLI by way of the double bounded contingent valuation technique that seeks to estimate unobserved willingness to pay by soliciting the lower bound (highest price at which they would buy) and upper bound (lowest price at which they would not buy) of their valuation. Preliminary analysis, investigated in more rigorous detail in Chantarat, 2009c, offers some revealing results.

Table 3 presents the percent of our sample across location who had a willingness to pay for IBLI at or above the quoted prices. Two prices were quoted, the actuarially fair price and the fair price with a 20% loading to account for possible mark-up and other business costs that may be associated with commercial provision. On average more than one third of the sample indicated a willingness to pay at least 20% above the fair price for the 10% strike contract, a figure that jumped to almost 70% for a 30% strike contract. One reason the 30% strike contract is likely to be more popular is because it is much cheaper. This also explains the lack of variation between the fair and fair + 20% contracts. At such low costs, an additional 20% is often times trivial.

3.4 Commercial Contract Features and Terms

Having established a strong potential demand for IBLI at commercially sustainable prices what remains is to pilot the product. To launch the IBLI contract on the market five key contract parameters

must be clearly set out: 1) The geographical area that the contract covers, 2) The "premium" or the price paid for insurance coverage, 3) The "strike point," meaning the index level at which the insurance is activated and payouts begin, 4) The value that will be paid for each livestock unit that is later estimated to have been lost, 5) The length of time for which paid coverage lasts.

3.4.1 Geographical coverage of contract:

Marsabit District will be covered by the two different response functions previously described above (Figure 4).   The Chalbi response function underlies the Upper Marsabit contract consisting of Maikona and North Horr divisions, and the Lower Marsabit contract consisting of Central, Gadamoji, Laisamis, and Loiyangalani divisionsis based on the Laisamis response function (Figure 5).   The boundaries were chosen due to clear agro-ecological and pastoral production system differences as well as differences in risk. Upper Marsabit has a higher fraction of camels and small stock in their herds than do Lower Marsabit. While the two contract clusters imply two different prices, premium-payouts will be division-specific. Therefore, in the Lower Marsabit cluster for example, there will be 3 different division-specific livestock mortality predictions for the index upon which premium payouts will be determined.

3.4.2 Annual contract premiums and strike point:

For the Marsabit Pilot launched in January of 2010, the relevant premiums as established by the commercial partners are presented in Table 4. These prices are specified for a contract with a strike point at 15%; the chosen trigger level. 15% was finally chosen after a process of negotiation among the commercial and technical partners that involved a tradeoff between a lower strike, which would provide greater risk coverage but cost more, and a higher strike which while cheaper covers a lower portion of the risk. One can think of the strike point as a deductible. Individuals will cover any losses up to 15% predicted mortality and insurance will compensate for any loses above that. The consumer price is the amount the clients in the specified coverage area paid for.[4] The actual market price, however, includes the full costs of commercial partner commissions and the relevant taxes. The difference is currently being subsidized by donors. The expectation is that as the novelty of the product wears off and late-adopters enter the market increased competition and the market coupled by greater capacity in the industry will bring the actual price down to the consumer price which represents a 30% loading on the fair premium on average.

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[4] Clients do not have to be living in the area that they purchase coverage for. They only have to state that the herd they are insuring largely resides in the coverage area. Nevertheless, for the pilot, clients did not have to provide proof of livestock ownership.

3.4.3 Insurable livestock unit and value of herd

The standard livestock types for a pastoral herd will be covered. These are: Camel, Cattle, Sheep and Goats. To arrive at an value for the insured herd, the four livestock types will be transformed into a standard livestock unit known as a Tropical Livestock Unit (TLU), where: 1 TLU = 1 Cow, 1 TLU = 0.7 Camel, 1 TLU = 10 goats and 1 TLU = 10 sheep. Using average prices for livestock across Marsabit and discussion with key traders and stakeholders we have arrived at a set price per TLU insured of Ksh 15,000.[5]

3.4.4 Temporal Structure of Contract

Figure 6 below presents the time coverage of the IBLI contract being piloted. The contract is an annual contract whose coverage spans from March 2010 to Feb 2011. IBLI contracts (and other Index-Based Insurance contracts) can only be purchased within a specific time window which in this case is in Jan and Feb 2010 (and August/September 2010 for contracts spanning October 2010 to September 2011). Contracts must be sold within this time frame as the rainy season beginning right after that may give the potential buyer information about the likely conditions of the season to come that would unfairly affect his purchase decision. This annual contract has two potential payout periods: At the end of the long dry season in September and at the end of the short dry season in February. At these points of time, if the index reads greater than 15%, insurance will pay clients.

3.4.5 How doesIBLI work?

As an example, let us consider the Gudere family in Kargi who purchase 10 tropical livestock units of IBLI insurance for the period covering March 2010 to February 2011. At Ksh 15,000 per livestock unit, Gudere's herd would be valued at Ksh 150,000 (=15,000*10). As Kargi is located in Lower Marsabit, Gudere would pay an annual premium of Ksh 4875 (which is 3.25% of Ksh 150,000) to cover his entire herd for the annual coverage period. Put in perspective, this is about the value of just over 3 goats to insure 10 cows over the space of a year.

Once Gudere has purchased insurance, he will now wait to see if he receives any compensation. At the end of September, we would obtain the 2010 long rain/long dry NDVI data for Laisamis Division which Kargi is in and feed those data into the Laisamis response function, generating the predicted mortality index. Suppose the predicted mortality rate is 13%. Gudere would not receive any compensation. However, lets imagine that at the next possible payout period, in February 2011, the

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[5] While in theory clients can simply state their subjective valuation of the herd they want to insure, we opted for a standard price for ease of administration. The standard price was derived as a function of household level livestock sale price data (Chantarat 2009a).

predicted mortality for Laisamis at that time is 25%. This 25% mortality index is then compared to the contractually stipulated strike point of 15%.   In this example, the Gudere family would receive compensation for 10% (=25%-15%) of their covered herd of 10 livestock units. They would thus receive a payment of KSh15,000 (= 10% of Ksh 150,000, the insured herd value). All the Gudere's insured neighbors in Laisamis would receive compensation at the same predicted rate of 10% of their insured herds. Those who bought no insurance would receive no indemnity payment.

4. Launching the IBLI Pilot

Critical to the objective of launching a commercially sustainable product was convincing commercial partners to take up the product and offer it through the market. Through a process of broad engagement with potential partners, a tripartite of interested parties collaborated with the International Livestock Research Institute (ILRI) to launch the pilot in Marsabit. UAP Insurance Company of Kenya (UAP), re-insured by Swiss Re together underwrites the risk while Equity Insurance Agency (EIA) provides the agency services taking care of extension, publicity and sales. ILRI and her research partners (Cornell University, Syracuse University and the University of California-Davis) offer the technical support and provide the evaluation and impact assessment services.

4.1 The delivery channel

Marsabit is a remote, sparsely populated and relatively infrastructure deficient area. As such, in thinking through product implementation, one cannot ignore the hardships that may arise in targeting clients, accepting premiums, and making indemnity payments within a system that generates enough confidence to allow for active market mediation. UAP and particularly EIA would need to develop an administrative infrastructure that can cost-effectively contract transactions.

Fortunately, a substantial social protection program dubbed the Hunger Safety Net Program (HSNP), funded by the U.K. Department for International Development (DfID), began rolling out in four of Kenya's poorest districts in 2009. Within a year, and for the first four year phase of its ten-year expected duration, the HSNP plans to deliver regular cash transfers to 60,000 households spread across Mandera, Marsabit, Turkana and Wajir. This is a huge task for which a well-designed delivery channel with a wide network across these regions is required.

The Financial Sector Deepening Trust (FSD), in conjunction with Kenya's Equity Bank (EIA's parent firm), has been working on just such a delivery channel and had the responsibility of creating the necessary Information and Communication Technology (ICT) and financial infrastructure needed to support the HSNP program. Equity Bank was contracted to open over 150 new Points of Sale (PoS)

across these regions that will be able to facilitate and provide the HSNP cash transfer to recipient households. Using new hi-tech portable devices within a sophisticated computing system, these PoS devices can be easily configured to accept premiums for certain insurance contracts and register indemnity payments when necessary. EIA will use this delivery infrastructure to offer IBLI contracts. Where EIA wants to offer the product in Marsabit communities not selected to receive HSNP cash transfers, it would be easy to extend the network to these areas.

4.2 Preparing to Launch

An entirely new product requires several layers of preparation for it to be successfully launched into the market. First, any required regulatory authorization must be secured. The partners attained regulatory approval to proceed from the Insurance Regulatory Agency (IRA) of Kenya. The IRA's main concern was the question of 'insurable-risk' whereby the insured party's covered risk is very clear. We argued that one of the key benefits of an index-insurance product that drastically reduced transactions costs was that there was no need for insurance companies to verify actual livestock losses as payments were entirely a function of the index. As such, we recommended that insurance is sold without requiring the agent to verify if the client actually owns all the livestock that they intend to insure. While this means there is no real way to ensure that the client will indeed face the risk that he is insuring against (drought related livestock mortality), the IRA finally agreed with the caveat that they would further review the issue should the success of the pilot result in more comprehensive scale-out across the country.

The next step was to publicize the product and prepare the extension effort. In an environment such as Marsabit, it is critically important to receive blessings from influential members of the community. As such, we called a workshop of key stakeholders ranging from key government line ministries and NGOs, to local government representatives, community elders and traders to carefully explain the product features to them, the pilot strategy and the on-going evaluation efforts. Many were already familiar with the product given the earlier research effort in which we had engaged them.

Given the characteristics of the region where publicity is best received by word of mouth, our key client engagement strategy was through interaction with trained extension agents. As such, we held a week long training of close to 20 Master Trainers (MT) selected among professionals working in relevant capacities or previously associated with the IBLI research process. This was followed by another week long training, run together with the MT's, of Village Insurance Promoters (VIPs) who were recruited from the target villages. In addition to supervising the VIPs, MTs were expected to be able to answer any questions relating to the product's features and the implementation process not only from

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clients but also interested partners and institutions. VIPs on the other hand provided the key grassroots extension effort directed at potential clients.

With all this in place the IBLI product was launched on 22nd of January 2010 in a colourful ceremony in Marsabit town. The launch was presided over by the CEO of Equity bank and brought together high ranking officials including the Minister for Livestock and the local Member of Parliament as well as the Secretary General of the Supreme Council of Kenyan Muslims who came in to endorse the product. The high profile event generated significant buzz that travelled by word of mouth to various corners of the district; the launch also attracted the attention of reputable national and international media houses.   For the next six weeks until the end of February when the selling window closed, the MTs and VIPs fanned out to offer their extension services and sales agents began, for the first time, to sell IBLI to clients across Marsabit district.

4.3 Sales and Lessons Learned

Results from the first IBLI sales in Marsabit went beyond most expectations. In the six weeks of sales after the launch a total of 1,979 individuals purchased insurance contracts to cover a total of 3908 cattle, 15,826 sheep and goats, and 339 camels. Total premiums collected thus came up to USD46,597. Table 5 presents the relevant sales statistics by cluster (Upper and Lower Marsabit).

This result, by highlighting the promise and potential of IBLI in the area has reinvigorated the commercial partners who are already beginning to think of scaling-up the pilot beyond Marsabit district. It is instructive to note that underlying the high level of sales was an often sub-par implementation effort, discussed in some detail below, that was fraught with challenges. Indeed, had sales delivery process gone as planned, we estimate that we could have sold, at the very least, twice more than we did.

After the sales window ended on Feb 28th, the project team returned to Marsabit in mid-March where we brought together various key stakeholders ranging from a select group of Master Trainers and Village Insurance Promoters, some of the clients that had purchased insurance, village-level government representatives as well as officials of government line ministries and the heads of local NGOs. The objective was to reflect on the successes and failures of the implementation process, gather perceptions on the product and solicit information to help improve the extension and sales effort for the subsequent sales period. The workshop was held against the backdrop of heavy rains that occurred in the first two weeks of March resulting in vigorous vegetation response reducing the likelihood of an insurance payout in September.

The workshop was extremely insightful, generating helpful discussion and highlighting both the key opportunities that must be tapped and the challenges that need to be addressed. Some of the more important issues raised include:

- *A flawed sales process*: The major concern, largely voiced by the Master Trainers and Village Insurance Promoters, was that a failure in the sales delivery system dampened sales and left many interested clients frustrated. As it happened, the software needed to allow the Point of Sale terminals to transact sales of IBLI was not ready on time and thus sales had to occur manually with agents being driven from town to town to carry out the transactions. With the poor roads and communications infrastructure in Marsabit district and the long distances that needed to be covered this proved to be a real challenge and some towns could only be visited once or twice during the six week sales window, often coming in unannounced before the VIPs could rally together interested clients. Consequently, there were many clients who expressed strong interest but were unable to be served, at certain points even getting frustrated and losing confidence in the product.

  Fortunately the software will be ready in time for the next selling period in September. However, as the PoS terminals may not completely cover the whole district, a clear logistical plan to ensure that all interested clients are served in a cost-effective manner will need to be put in place.

- *Publicity should be improved:* It was noted that in certain places individuals were not aware of the product and that the best way to improve awareness and knowledge of the program was by ensuring the area chief was informed. Radio programming on vernacular stations was also encouraged.

- *Payout trigger too high:* There was also the feeling that a 15% payout trigger level was too high and that it should be lowered to 10% where payments would be made more frequently and cover more of the loss. There was no real conclusion when it was made clear that a reduced trigger level would mean higher prices. However, it is an important issue to consider as relatively minute indemnity payments made infrequently may begin to erode confidence in the product.

- *Lack of payout may affect demand:* Indications, due to the heavy rains, that the contract would not payout in September left several worried that without a payout in the near future, demand for the product would be severely affected. While this may be true there were also several voices among those who had purchased who were relieved that there was rain but recognized that as drought was inevitable in the system, IBLI would continue to have value. Nevertheless,

what the actual impact of continued non-payout is remains to be seen. However, it is clear that ensuring clients have a solid understanding of how the IBLI product works is critical. The extension message needs to be tweaked to emphasize the downside risk protection role that IBLI pays.

5. Conclusion

The effort to design and pilot IBLI as a commercially sustainable tool to help the pastoralists of Northern Kenya to insure themselves from drought related livestock mortality has largely been a success. It was a process that began with the identification of the key source of vulnerability plaguing pastoralists and the recognition that IBLI may be a promising intervention to help manage the main source of risk they face – widespread livestock losses due to drought. What followed was an effort to investigate the feasibility of developing an IBLI product. Marsabit district, where the first IBLI contracts were sold, met all the necessary prerequisites for development; the data needed to model IBLI were available, harsh droughts were established as the leading cause of livestock mortality in an area where livestock formed the backbone of livelihoods, research identified the likelihood of demand capable of supporting a market mediated product, and the delivery infrastructure for the provision of the contracts was already in place.

The relatively high sales generated from the first sale window are a promising sign but it is still too early to reach a definitive verdict and there are several challenges still to surmount. Nevertheless the train has left the station and is moving fast. Growing interest from both commercial and development partners demands that we aim to rapidly scale up the project to other ASAL districts in Kenya and investigate the feasibility and applicability of IBLI in similar contexts in other countries and regions. We do, however, need to ensure that we can walk firmly before we run. A careful effort evaluating the process and product and rigorously assessing its impacts across various welfare indicators is critical. To this end a comprehensive baseline survey of over 900 households across 16 Marsabit communities was undertaken in September and October 2009. These households will be revisited annually over three years generating information needed to understand just how well IBLI works as a risk management tool as well as the indirect effects it has on household wealth and welfare.

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TABLES

Table 1: Insurance Contract Performance

Cluster	Strike	Correct trigger decision	Incorrect decision	
			Type 1 Error	Type 2 Error
Chalbi	10%	0.71	0.13	0.17
	15%	0.81	0.06	0.13
	20%	0.88	0.04	0.08
	25%	0.85	0.10	0.04
	30%	0.94	0.04	0.02
Laisamis	10%	0.80	0.09	0.11
	15%	0.88	0.03	0.09
	20%	0.84	0.09	0.06
	25%	0.81	0.14	0.05
	30%	0.84	0.13	0.03

Table 2: Annual Actuarially Fair Premiums for Selected Strike Points Across Premiums

Cluster/Contract	Premium Rate (% of insured value)			
	10% Strike point	15% Strike Point	20% Strike Point	25% Point
Chalbi Cluster	9%	5%	3%	1%
Laisamis Cluster	5%	3%	1%	1%

Table 3: Percent of Respondents Willing to Pay At least the Stated Amount for ILBI by Location

Location	10% Strike		30% Strike	
	Fair	Fair +20%	Fair	Fair +20%
Overall	50%	34%	69%	69%
Dirib Gombo	71%	41%	78%	78%
Kargi	46%	32%	50%	50%
Karare	81%	75%	100%	100%
Logologo	30%	14%	57%	57%
North Horr	35%	22%	71%	71%

Table 4: IBLI Premiums for 15% Strike Contracts in Marsabit

Contract Cluster	Consumer Price	Total Market Price
Upper Marsabit	5.5%	9.2%
Lower Marsabit	3.25%	5.4%

Table 5: IBLI Contract Sales Figures for Jan/Feb 2010

|	PREMIUM RATE	CONTRACTS SOLD	CATTLE NO. INSURED	SHEEP/ GOATS NO. INSURED	CAMELS NO. INSURED	TOTAL VALUE OF INSURED LIVESTOCK (USD)	TOTAL VALUE OF COLLECTED PREMIUMS (USD)
UPPER	5.5%	556	371	11,081	185	347,620	19,119
LOWER	3.25%	1,423	3537	4,745	154	845,460	27,477
TOTAL		1,979	3908	15,826	339	1,193,080	46,597

FIGURES

Figure 1: Income Sources By Livelihood Grouping
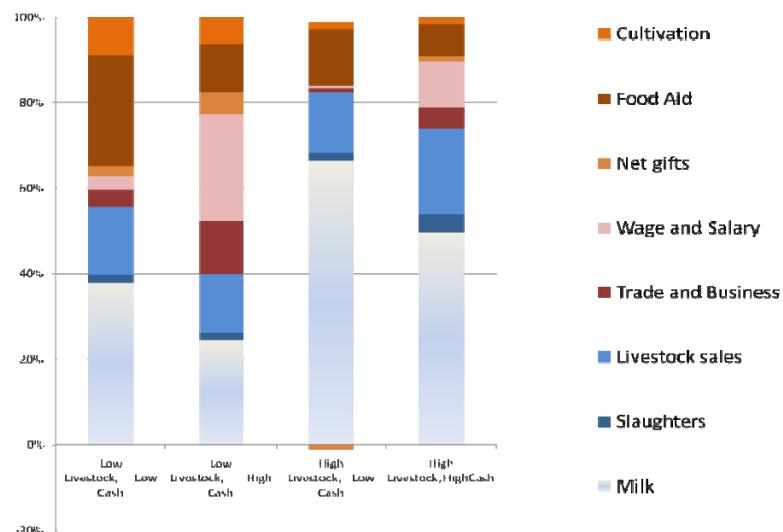
Source: McPeak et al. 2010b

Figure 2: Causes of Livestock Mortality
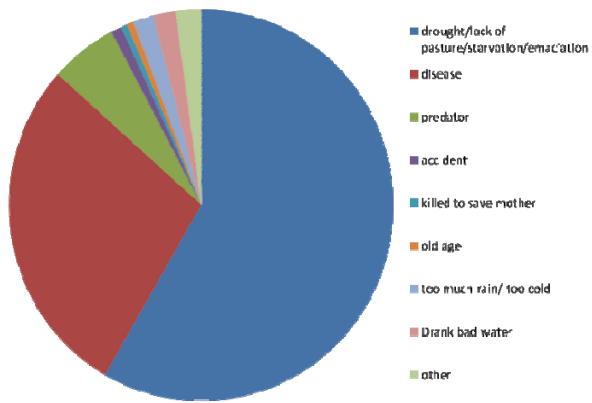
Figure 3: Causes and Relative Number of Livestock Losses by Season

Source: McPeak et al. 2010b.
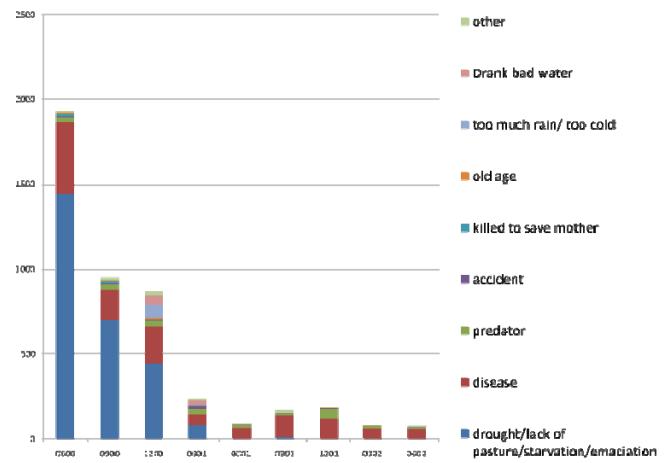
Figure 4: Chalbi and Laisamis Contract Coverage Clusters
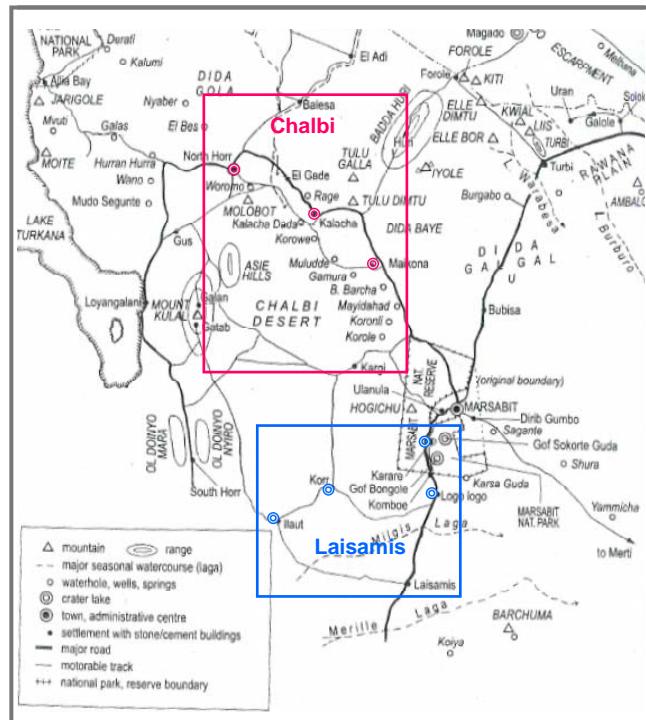
**Figure 5: Contract Spatial Coverage**
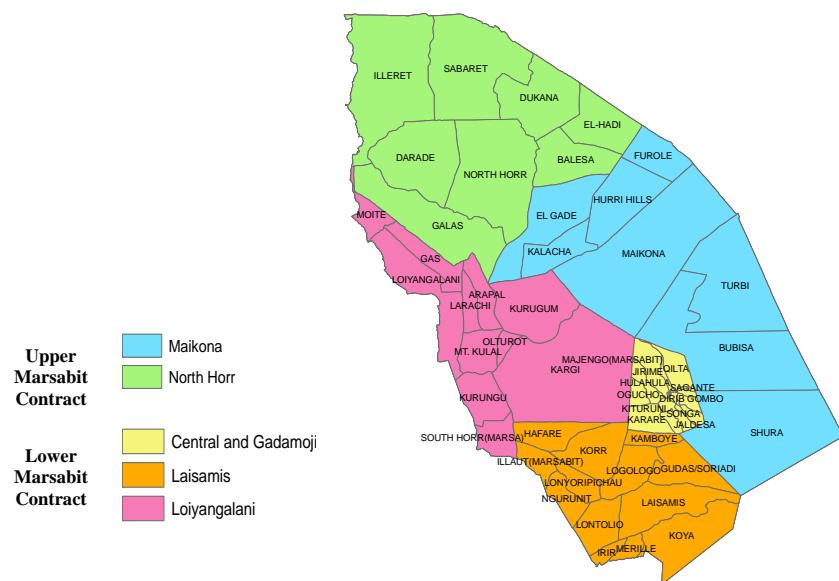
Figure 6: Temporal Structure of IBLI contract

Source: Chantarat et al. 2009.