

THE FAVORABLE IMPACTS OF INDEX-BASED LIVESTOCK INSURANCE: EVALUATION RESULTS FROM ETHIOPIA & KENYA

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IBLI agent providing product education and outreach to a household in northern Kenya.

Photo Source: International Livestock Research Institute

Livestock—the principal store of wealth and source of livelihood for pastoralists living in the arid and semi-arid lands (ASAL) of the Horn of Africa—face tremendous risk from the frequent and catastrophic droughts that plague the region. Livestock losses can be especially catastrophic in this setting due to the poverty traps that characterize the system. Shocks can thrust once-prosperous households into chronic destitution. In much of the world, insurance is commonly used to mitigate such shocks. Unfortunately, the high costs imposed by actuarial data collection, adverse selection, monitoring for moral hazard, and validating claims make conventional insurance policies unavailable in this geographically isolated and sparsely populated region. As a result, an overtaxed global humanitarian response system has, for decades, been the primary source of insurance against catastrophic drought events.

KEY POINTS

The Index Based Livestock Insurance (IBLI) product leverages the strong correlation between a remotely sensed vegetation index and livestock losses associated with forage shortages to offer insurance coverage to pastoralists in regions without access to conventional insurance products. The IBLI product was first launched in January 2010 and is now available in several regions of northern Kenya and in the Borana region of southern Ethiopia. This brief draws together the findings from several longitudinal evaluations of the IBLI product in both countries. Important findings include:

- IBLI coverage has strong positive impacts on subjective, economic, and health-related indicators of well-being. The gains are especially pronounced in the midst of drought events.
- The marginal benefit/cost ratio of IBLI substantially exceeds that of unconditional cash transfers.
- These gains emerge despite IBLI's imperfect coverage of purchaser's risk exposure.
- Uptake of the product has been significant, with more than 40% of sampled households purchasing IBLI at least once.

Over the past decade, index insurance has generated excitement among development organizations and national governments as a tool for extending access to formal insurance into environments that are inhospitable to conventional insurance, such as the ASAL. Index insurance bypasses many of the transaction costs associated with conventional insurance by basing policies on signals that are easy to observe and generally uninfluenced by individual action. In addition, index products typically use a single index, further reducing transaction costs. The tradeoff is that index insurance only covers covariate shocks – the average losses within a community – leaving some household-specific, idiosyncratic shocks uninsured. For index insurance to successfully mitigate the impact of drought shocks on the insured, the index must be highly correlated with covariate risk and covariate shocks must present a substantial risk.

Index-Based Livestock Insurance

IBLI was first launched in Marsabit county of Kenya in January 2010. Since then, it has been expanded to include Isiolo (August 2013), Wajir (August 2013), Garissa (January 2015), and Mandera (January 2015) counties in Kenya, and the Borana region of Ethiopia (July 2012). The Government of Kenya is exploring the possibility of taking a variant of IBLI nationwide under a proposed Kenya Livestock Insurance Program. The details of the IBLI contracts vary by region, but they are each developed to reflect deviations from historic averages of a remotely sensed and publically available Nor-

malized Differenced Vegetation Index (NDVI) measure of rangeland vegetation density. As of this writing (April 2015), 10,067 IBLI contracts have been sold and 149,007 USD in indemnity payments have been made to insured pastoralists of these regions.

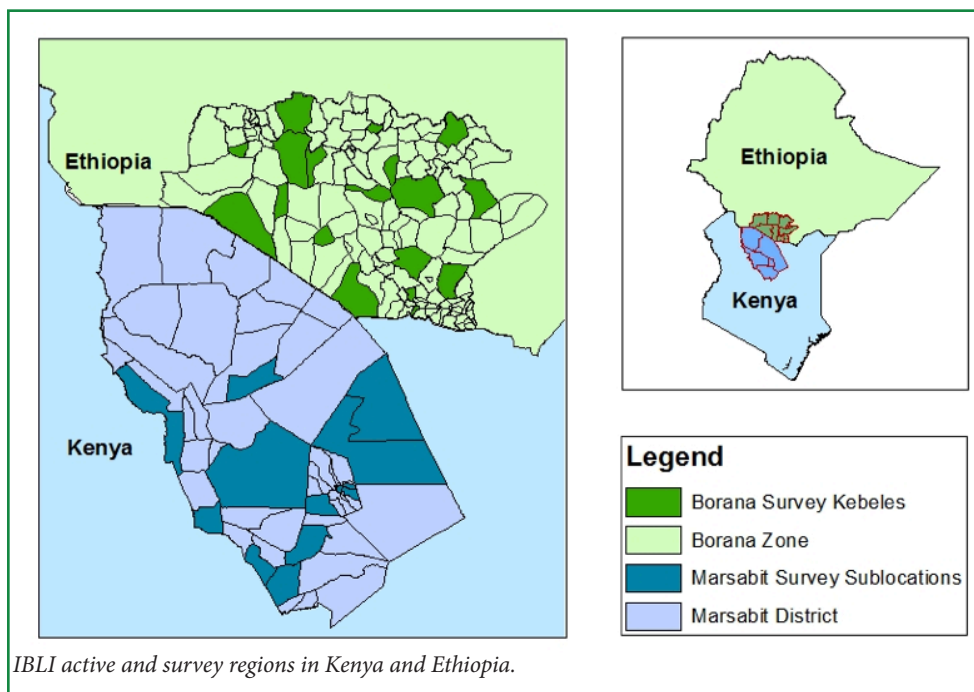
The IBLI research team launched annual longitudinal household surveys in the Marsabit and Borana regions in order to monitor factors leading to IBLI uptake and to rigorously evaluate the impact of IBLI coverage on a variety of indicators of well-being and behaviors. Both surveys include baselines collected before IBLI was available in the region. The Marsabit annual survey started in 2009 and has been collected for 5 different years, each with 924 households. The Borana annual survey, first collected in 2012, has now been collected from 515 households for 4 rounds.

A set of randomized experiments was implemented among the surveyed households in order to learn about the impacts of price and product outreach on consumers' understanding and uptake of the IBLI products. Price incentives, in the form of randomly distributed discount coupons that reduced premiums from 10%-100% for the first 15 covered livestock units were distributed among surveyed households before each sales season. Randomized extension campaigns using a variety of games, videos, cartoons and radio broadcasts have also been implemented. These experiments generate experimental variation in IBLI purchases that can be used to untangle the complex web of factors leading

to purchasing insurance in order to let us isolate the causal effect of IBLI uptake on a variety of household behaviors and well-being indicators.

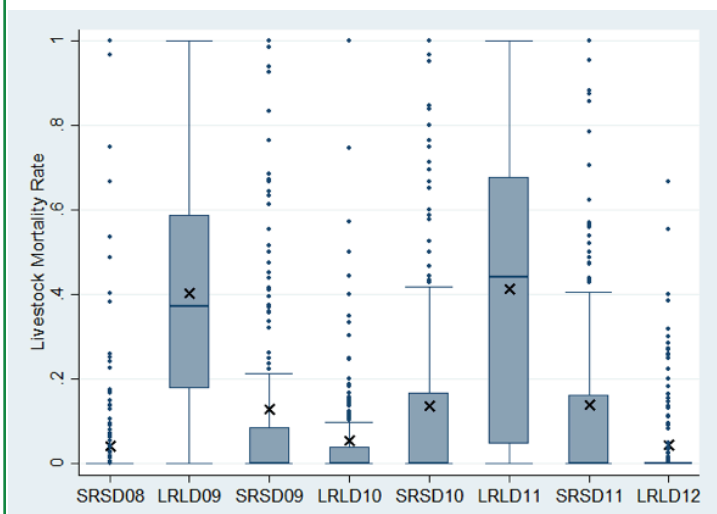
Basis Risk

Index insurance policies make indemnity payments according to index readings, rather than the actual losses that policy holders experience. The indices are intended to reflect area-average losses, but necessarily do so with error. Furthermore, heterogeneity between individuals within an index area can result in un-indemnified losses



IBLI active and survey regions in Kenya and Ethiopia.

Household livestock mortality rates by season in the Central Marsabit region



Notes: The distribution of household-specific losses within the Central Marsabit region for each season – from short rainy-short dry 2008 (SRSD08)-Long Rainy Long Dry 2012 (LRLD12) – depicted by boxes for the interquartile ranges, with the upper and lower adjacent values are either 3/2 the interquartile range or the value furthest from the median. The remaining observations fall outside the adjacent values. The means are marked with an 'X'.

even if an index perfectly tracks average losses. The differences between insurable losses and indemnity payments, called basis risk, is a chief weakness of index insurance. IBLI (in Marsabit) appears to be the first index insurance product to have its basis risk studied rigorously, for the simple reason that most index insurance studies lack adequate longitudinal household data.

The basis risk faced by IBLI insured households is substantial. In Marsabit, IBLI covers only 62-77% of the herd mortality risk that households face. The remaining basis risk is partially due to index error, or differences between predicted and area-average livestock mortality rates. A much larger portion of basis risk arises from between-household variation in livestock loss rates. The figure above illustrates the high degree of heterogeneity between households across eight seasons in Central Marsabit. At best, a perfect index product could mitigate the risk associated with variation in the means across seasons. Households insured with a perfect index product would continue to face the risk associated with variation around the means.

Uptake

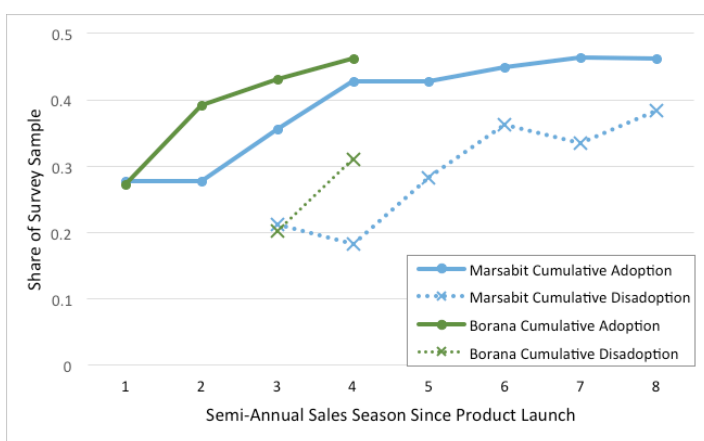
Demand for IBLI has followed a similar dynamic in both the Borana and Marsabit pilot areas. The initial launch and associated commercialization and outreach

was met with robust demand for the product. In the sales periods following the launch, there is a continued upward trend in cumulative adoption but there is also a substantial rate of disadoption (figure below). Some disadoption is not surprising as households experiment with the product, especially if they do not receive indemnity payments early on that build their trust in the underwriter. Logistical complications have also likely dampened demand, for example, causing cancellation of the 2nd and 5th Marsabit sales windows.

In addition to implementation factors due to the delivery channel, household and policy characteristics play an important role in demand for IBLI. Similar to the experience in other index insurance pilots elsewhere, household financial liquidity is positively correlated with demand, which is significantly, but inelastically, related to price. Households in regions with greater basis risk are more responsive to prices. Although in this region livestock ownership is commonly concentrated in the hands of men, while women customarily bear responsibility for milking herds and selling milk, there is no apparent gender difference in IBLI uptake.

Households also exploit ecological signals when making purchase decisions, buying less coverage when they foresee good rangeland conditions and more when they anticipate a difficult season. Spatially, demand is greater where average risk, especially covariate risk, is greater. Those who have been educated about IBLI, and therefore grasp the concept of basis risk, are sensitive to

IBLI adoption and disadoption among surveyed households



Notes: Cumulative adoption is the proportion of surveyed households that had ever purchased IBLI coverage by the end of the sales window. Cumulative disadoption is the number of households that purchased IBLI but then let the policy lapse by not purchasing further coverage in a subsequent season. The slight dip in disadoption seen in Marsabit is due to re-adoption, as households repurchase with a lag following a period without coverage.

higher rates of idiosyncratic losses.

Production and Welfare Impacts

In spite of the necessarily incomplete coverage IBLI offers against herd losses, it appears to benefit – or would benefit – most households in the ASAL regions studied across a range of different indicators.

Even at the unsubsidized commercial premium rate, approximately equal to the actuarially fair rate with an additional 40% loading for firm overhead and profits, purchasing full IBLI coverage for all the seasons in the data cost, on average, the equivalent of 1.1% of herd size. In exchange, IBLI sharply improves the skewness of herd survival rates – increasing, on average, by 45.1% (from -1.185 to -0.651, $t\text{-stat}=10.31$) – by considerably reducing the risk of catastrophic losses. Simulations find that the improvement to skewness dominates, such that the majority of households are better off purchasing full IBLI coverage than choosing the no insurance alternative.

In 2011 there was a catastrophic drought in the Horn of Africa. In Marsabit, IBLI coverage had significant effects on the coping strategies that households expected to use during the final months of the drought. Insured households were 36% less likely to anticipate relying on distress sales of livestock and 25% less likely to foresee reducing meals to cope with the drought.

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Looking across both drought and non-drought years in Marsabit, households with IBLI coverage increase investments in livestock veterinary and vaccination services, and reduce herd size (most likely reflecting a reduction of precautionary savings in response to an insurance alternative). These and other changes to production strategies among the insured seem to pay off, increasing the milk productivity of livestock and the total value of milk produced. There is also a positive im-

pact on other indicators of well-being, including greater household income per adult equivalent (AE) and improvements to mid-upper arm circumference (MUAC), a strong predictor of child malnutrition.

Even in the absence of severe drought or indemnity payments, IBLI seems to improve purchasers’ well-being by reducing their reliance on costly ex ante risk reducing strategies or just providing improved peace of mind about drought risk exposure. By March 2014, IBLI had been available in the Borana Zone for 24 months and had been sold during 4 different sales periods, but had yet to make an indemnity payment. IBLI purchasers nonetheless exhibit significant and meaningful improvements in subjective well-being. These positive effects of IBLI coverage are large enough to overcome an observed and statistically significant negative impact of buyer’s remorse due to having spent money on insurance that did not pay off and thus, in retrospect, was an unnecessary expense.

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IBLI as a Cost-Effective Social Protection Tool

IBLI’s positive impacts do not, in themselves, justify investing scarce development or social protection funds in the design and delivery of index insurance products. One needs to have a sense of the opportunity cost of those funds; that is, how the expected benefit/cost ratio stacks up against other prospective interventions. In order to better understand the value of IBLI, its costs and impacts were compared with those of the Hunger Safety Net Program (HSNP), an ongoing unconditional, targeted cash transfer program launched by the government of Kenya in northern Kenya in 2009. The overlapping spatial coverage and timing in the launch of HSNP and IBLI created an opportunity to design a comparative evaluation of the two alternative approaches to investing in social protection in risky ASAL settings. Both IBLI coverage and HSNP participation increase household income from milk, income per AE and MUAC in children. By dividing the estimated local av-

verage treatment effects of each program by the total program cost born by the public per client served, we find that the two programs are comparably cost effective at their current scale. But for scale up, the average treatment effect per marginal cost of an additional client is more relevant than the total program cost per client, which includes the fixed costs of establishing the product and its delivery channel(s). In terms of marginal benefits/costs, IBLI is an order of magnitude more cost effective, reflecting the relatively large sunk costs of developing and marketing a new product in what was previously a non-existent market and the very low marginal costs to government or donors of additional insurees who purchase the product from private providers.

Summary

Index insurance shows considerable promise, especially in settings like the arid and semi-arid lands of east Africa where conventional insurance to cover potentially catastrophic herd losses does not exist. It is common knowledge, however, that index insurance products cannot practically provide complete risk coverage to policy holders. And uptake of some index insurance products has been low, raising questions about their attractiveness, scalability and sustainability. At the same time, development institutions and organizations have invested millions in developing and piloting new index insurance products because there are potentially large benefits from even modestly reducing risk for agricultural households in developing countries. Rigorous empirical analysis of the IBLI product in both Ethiopia and Kenya and across multiple years provides convincing evidence that investments of this sort can have strong, positive impacts on a variety of indicators of well-being and that those impacts per dollar

are at least on par with those from cash transfers programs and, at the margin, can be considerably higher. This work also illustrates that index insurance is not a single-shot solution to poverty and vulnerability to disasters. But when designed well, index insurance products such as IBLI offer an important tool to help address uninsured risk exposure problems, especially in places where alternative risk management tools are costly and significant losses of livestock can cast households into poverty traps from which escape is difficult.

Further reading

This brief draws together the findings of several analyzes of the IBLI product in both Kenya and Ethiopia. [Takahashi, Ikegami, Sheahan and Barrett \(2015\)](#) and [Bageant and Barrett \(2015\)](#) study IBLI uptake in Ethiopia. [Tafesse, Barrett, Lentz and Taddesse \(2014\)](#) study the impact that IBLI coverage has on subjective well-being of insured Borana pastoralists in the absence of indemnity payments. [Janzen and Carter \(2013\)](#) examine the impacts of IBLI coverage on coping strategies in Kenya during the devastating 2011 drought. [Jensen, Barrett and Mude \(2014a\)](#); [Jensen, Barrett and Mude \(2014b\)](#); and [Jensen, Mude and Barrett \(2014\)](#) examine the basis risk, uptake, and welfare impacts of IBLI in the Marsabit region of Kenya. The data used for the aforementioned papers are publically available and can be found on the [IBLI website](#).



B A S I S

The BASIS AMA Innovation Lab is a virtual institute hosted at the University of California Davis comprised of researchers from around the globe that aims to improve the agricultural competitiveness and quality of life of the rural poor in the developing world through policy-relevant research that is dedicated to improving access to resources and enhancing the operation of markets.

I4

INDEX
INSURANCE
INNOVATION
INITIATIVE

Hosted at the BASIS AMA Innovation Lab, the Index Insurance Innovation Initiative (I4) is a response to the overwhelming evidence that uninsured risk can drive people into poverty and destitution, especially those in low-wealth agricultural and pastoralist households. To rigorously test the hypothesis that by removing correlated risk from smallholder agricultural and pastoral systems we can reduce poverty and deepen financial markets in agricultural areas, the I4 team will design and implement a new generation of livelihood-optimized index insurance contracts.



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