



# The favourable impacts of Index-Based Livestock Insurance: Evaluation results from Ethiopia and Kenya

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## Key points

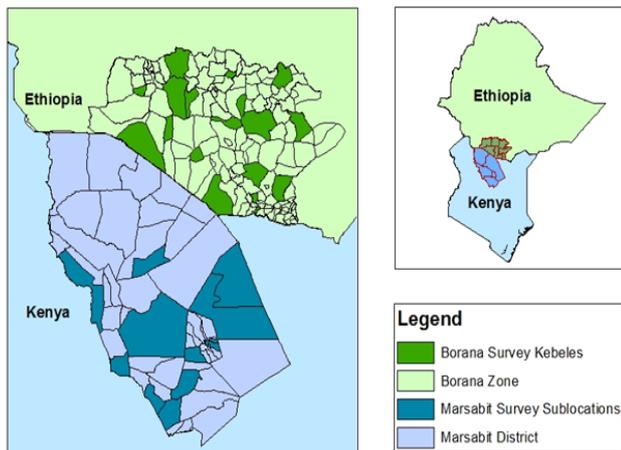
The Index-Based Livestock Insurance (IBLI) product leverages the strong correlation between a remotely sensed vegetation index and livestock losses associated with forage shortages to offer insurance coverage to pastoralists in regions without access to conventional insurance products. The IBLI product 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. The basis risk inherent to the product is considerable, with most of it due to inter-household heterogeneity and thus not amenable to reduction by tweaking the index design.
- Uptake of the product has been significant, with more than 40% of sampled households purchasing IBLI at least once. Demand for IBLI responds significantly to price, liquidity, basis risk and spatiotemporal variation in expected herd losses.

## Introduction

Livestock – the principal store of wealth and source of livelihoods for pastoralists in the arid and semi-arid lands (ASAL) of the Horn of Africa – face tremendous risk from frequent droughts. Livestock losses can be especially catastrophic due to the poverty that characterizes the system. Shocks can thrust prosperous households into chronic destitution. In much of the world, insurance is used to mitigate such shocks. Unfortunately, high costs imposed by actuarial data collection, adverse selection, monitoring for moral hazard and validating claims make conventional insurance policies unavailable in this isolated region. Instead, a stretched humanitarian response system has been the primary insurance against droughts.

Over the past decade, index insurance has generated excitement as a tool to extend 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.



IBLI was 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) in Kenya, and the Borana region of Ethiopia (July 2012). The Government of Kenya is exploring taking a variant of IBLI nationwide under a proposed Kenya Livestock Insurance Program.

IBLI contracts vary by region, but they are each developed to reflect deviations from historic averages of a remotely sensed and publicly available Normalized Differenced Vegetation Index (NDVI) measure of rangeland vegetation density. As of this writing (April 2015), 10,067 IBLI contracts have been sold and USD 149,007 in indemnity payments have been made to insured pastoralists.

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 various indicators of well-being and behaviours. Both surveys include baselines collected before IBLI was available in the region. The Marsabit survey started in 2009 and has been collected for five years, each with 924 households. The Borana survey, first collected in 2012, has now been collected from 515 households in four 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.

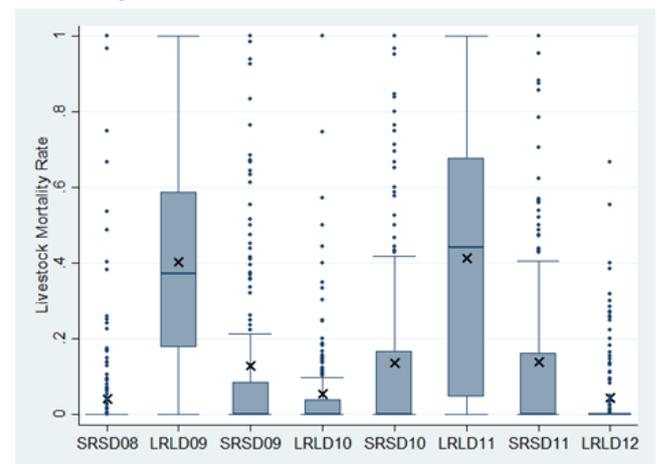
Randomized extension campaigns using a variety of games, videos, cartoons and radio broadcasts have also been implemented. These experiments generate experimental variation in IBLI purchases that can be used to untangle the complex web of factors leading to purchasing insurance in order to let us isolate the causal effect of IBLI uptake on a variety of household behaviours and well-being indicators.

## Basis risk

Index insurance policies make indemnity payments according to index readings, rather than actual losses experienced. The indices are intended to reflect area-average losses, but necessarily do so with error. Heterogeneity between individuals within an index area can result in un-indemnified losses 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, because 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. Figure 1 illustrates the high degree of heterogeneity between households across eight seasons in Central Marsabit.

Figure 1. Household livestock mortality rates by season in the Central Marsabit region.



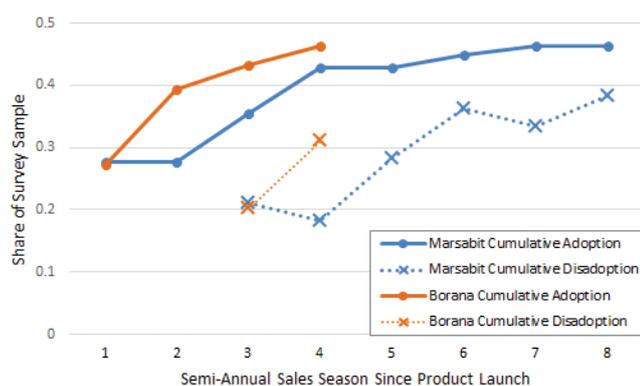
Notes: The distribution of household-specific losses within the Central Marsabit region for each season – from short rainy-short dry 2008 (SRSD08) to long rainy-long dry 2012 (LRLD12) – depicted by boxes for the interquartile ranges, with the upper and lower adjacent values are either 3/2 the interquartile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

At best, a perfect index product could mitigate risk associated with variation in the means across seasons. However, households insured with a perfect index product would continue to face the risk associated with variation around the means.

## Uptake

Demand for IBLI followed a similar dynamic in the Borana and Marsabit areas. The initial launch and associated 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 2).

Figure 2. 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.

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 2<sup>nd</sup> and 5<sup>th</sup> 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 experiences in other index insurance pilots, household financial liquidity is positively correlated with demand, which is significantly, but in-elastically, 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, with women customarily responsible 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 grasp the concept of basis risk, are sensitive to 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 costs, 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,  $t$ -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.

Looking across 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 milk productivity of livestock and the total value of milk produced. There is also a positive impact 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 four 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.

## 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 compares to other prospective interventions.

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 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 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 average 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 insureds who purchase the product from private providers.

## Summary

Index insurance shows considerable promise, especially in settings where conventional insurance to cover potentially catastrophic herd losses does not exist. However, index insurance products cannot practically provide complete risk coverage to policyholders 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 Ethiopia and Kenya and across multiple years provides convincing evidence that investments of this sort can have strong, positive impacts on well-being and these impacts per dollar are at least on par with those from cash transfer 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. 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.

Photo credit:

Page 1: ILRI/Riccardo Gangale

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Data used for these papers is publically available at <https://livestockinsurance.wordpress.com/publications/>

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