

Better lives through livestock

# Long Term Diffusion and Impacts of Index Based Livestock Insurance

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## Pastoralism, drought and the rangelands

- An estimated 50 million pastoralists in SSA.
- Pastoral household rely on extensive rangelands to generate a large portion of their income and maintain their main stock of wealth.
- Droughts cause low availability to forage which results in low productivity (milk, calves) and deterioration or loss of productive assets (livestock).
- Catastrophic income and asset (herd) loss due to drought has been identified as the major source of vulnerability and cause of poverty.





Data: World Bank, FAO, Esri



## Index Based Livestock Insurance (IBLI): Policies

**Objective**: To mitigate the impact of droughts on households.

Why index insurance? Cost—no need for client-level risk profiles or to verify losses.

**Signal:** eMODIS NDVI time series (USGS) that strongly correlates with live vegetation.

Index relies on historic NDVI observations (2002- current) to identify relative anomalies of extremely low vegetation accumulation.

**Payouts** are made in anticipation of forage scarcity to help maintain herds and welfare during the coming scarcity.

Policies are commercially sold by local insurance companies and reinsured through the international reinsurance markets.



NDVI spatially aggregated

MODIS NDVI image (10 day)

400 km

1-10 May 2011

0.20 - 0.25

Spatial

aggregation







Temporal accumulating

## Index Based Livestock Insurance (IBLI): Scaling

**Policies** have been commercially sold in Kenya since 2010 and Ethiopia since 2012.

IBLI was integrated into Kenya's social protection programming through the **Kenya Livestock Insurance Program (KLIP)** in 2015, which purchases IBLI on behalf of 18,000 households.

Since 2018 WFP has been using IBLI in the **Satellite Index Insurance for Pastoralists in Ethiopia (SIIPE)** program, to insure 5,000 households in the Somali region of Ethiopia and is currently piloting in Zambia.

A pilot is/was scheduled for Sudan and pre-pilot preparatory work is ongoing in Somalia.

**IBLI suitability and feasibility studies** have been/are being conducted across the IGAD region and the Sahel.

ILRI worked with the **Africa Risk Capacity (ARC)** to develop a new sovereign-level insurance product for pastoral regions.





## Index Based Livestock Insurance (IBLI): Uptake & Impacts

ARTICLES

RCTs implemented during the pilot phases in Kenya (2009-2015) & Ethiopia (2012-2015) have generated a great deal of knowledge.

#### Uptake

Product understanding, product quality, price, environmental conditions are all important factors.

#### **Drought coping**

- Reduction in likelihood of distress livestock sales
- Reduction in likelihood of reducing meals as a coping strategy

#### Production

- Increased livestock off-take in good seasons, when prices are high
- Increase investments in productivity through vet. & vaccination services •

#### Welfare

- Improved income
- Improve subjective welfare even in the absence of droughts/payouts
- Improved resilience

### **No evidence** of undermining informal insurance practices Mixed results on the impacts of coverage on resource use

Sources: Bageant & Barrett, 2016; Cissé & Barrett 2018; Janzen & Carter 2019; Jensen et al., 2017; Jensen et al., 2019; Matsuda et al., 2019; Tafere et al., 2019; Takahashi et al. 2019; Taye et al. 2019; Toth et al. 2014





### **Research Questions**

1. Which factors relate to the dynamics of IBLI sales/purchases?

Rupsha Banerjee (IRLI), Diba Galgallo (IRLI), Kelvin Shikuku (ILRI) Nils Teufel (IRLI)

2. What are the long-term impacts of early IBLI adoption?

Rupsha Banerjee (IRLI), Chris Barrett (Cornell), Karlijn Morsink (Utrecht), Hyuk Son (Utrecht & Cornell), Nils Teufel (IRLI)



### Which factors relate to the dynamics of IBLI sales/purchases?

Data: Administrative data from insurance firms (N=4): 115 index-units, 2010-2020, 2 sales seasons/year, N~1,500



### Pooled distribution of sales

The unconditional (left) and conditional (right) distribution of IBLI sales

(Observations at the index unit and sales season level)



There were zero sale in about half of the observations during which IBLI was available; foreshadowing a distinction between available and accessible.

### Are there (observed) fixed characteristics of Index Units (IU) that make them (un)likely clients?

 $Ratio = \frac{Number of seasons in which sales > 0}{Number of seasons in which IBLI was sold}$ 

Statistics of the second second



VARIABLES	Ratio
Livelihood: Agropastoral <sup>1</sup>	0.29
	(0.23)
Livelihood: Pastoral <sup>1</sup>	0.17
	(0.22)
Livestock population (1000s)	-0.00032
	(0.00076)
Human population (1000s)	-0.00014
	(0.00087)
Population density (1000s/km)	-0.078
	(0.27)
Distance to large town (km)	-0.0040**
	(0.0019)
Fatalities from violence	-0.016
(mean over the last 10 years)	(0.010)
Observations	108
R-squared	0.086

 $^1$  Omitted category is "cropping or fishing" (N=4). Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



### Which factors relate to IBLI sales/purchases?

 $y_{ut} = \beta_0 + \beta_1 Implimentation_{ut} + \beta_2 Envinronment_{ut} + \beta_3 Firm_{ut} + \beta_4 Circumstances_{ut} + \beta_u + \beta_t + \varepsilon_{ut}$ 

Where: u = index unit, t = sales season

 $y_{ut} \in \{\text{any policies, total policies, ratio of population with coverage, ratio of livestock with coverage}\}$   $Implimentation_{ut} = [\text{premium rate, subsidies, marketing support, replacement vs. protection, payouts in t-1]}$  $Environment_{ut} = [\text{index during sales season, index in previous season, LRLD/SRSD sales season]}$ 

 $Firm_{ut}$  = [which firms is selling insurance in that unit]

*Circumstances*<sub>ut</sub> = [KLIP coverage, human & livestock population, conflict, distance to town, average NDVI]



# When are there *any* sales?

Shapely decomposition of the contribution of each group to the explanatory power of the model (N=~1,315).

VARIABLES	Probit	Probit	Probit
Implementation	30%	20%	15%
Environmental	5%	5%	5%
Firm	35%	24%	21%
Circumstances	17%	12%	7%
Time controls	13%	10%	10%
Fixed effects		30%	42%
Fixed effects type	None	District (N=10)	Index Unit (N=115)
Pseudo R2	0.22	0.29	0.37

- There is a great deal of variation between firms—some firms generate sales in many more of the IUs that they work in than others.
- Even after accounting for and distance to markets, conflict, human & livestock populations, location is as important the combined impacts of commonly studied factors.
- Looking within group:
  - Subsides are extremely important, while premium rates are not
  - The introduction of KLIP reduces the likelihood of any commercial sales
  - The switch to asset protection had a positive impact on sales



# What impacts purchase & coverage rates?

Shapely decomposition of the contribution of each group to the explanatory power of the model (N=~765).

	Number of	Policies/Human	TLU covered/	Number of	Policies/Human	TLU covered/
VARIABLES	Policies	Population	TLU population	Policies	Population	TLU population
Implementation	11%	10%	5%	6%	3%	3%
Environmental	13%	10%	3%	7%	3%	1%
Firm	17%	9%	24%	8%	3%	13%
Circumstances	7%	40%	8%	2%	1%	1%
Time controls	42%	18%	57%	23%	6%	31%
Fixed effects	10%	13%	3%	54%	84%	51%
Fixed effects type	District	District	District	Index Unit	Index Unit	Index Unit
R2	0.0165	0.0428	0.0227	0.0335	0.146	0.0429

- Similar to other studies on the level of purchases, our model has very little explanatory power
- Even after accounting for and distance to markets, conflict, human & livestock populations, location is as important as the combined impacts of commonly studied factors.



## Lessons and next steps

While the characteristics of the insurance policies are important, there are unobserved firm, agent and location level characteristics that are much more important.

This is true even in this example, where the firms, the policies, how they are sold, and the regions that they are being sold in, are quite similar.

These lessons are a word of caution on assuming external validity of location or firm specific studies and highlights the importance of the partnering with "strong" insurance firms when using insurance as an intervention. (We should take seriously that private firms have very different incentives than development organizations and researchers.)

Next steps:

• To unpack those firm, agent and location level factors, we will be conducting interviews with insurance firms (HQ and agents) to better understand their investment strategies and thoughts on our work.



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# What are the long-term impacts of early IBLI adoption?

### Data:

- 1) Existing longitudinal household surveys in pastoral regions of Ethiopia and Kenya
- 2) Collected additional rounds of two similar longitudinal household surveys Kenya and Ethiopia
- 3) Implementation data on randomized premium discounts
- 4) Respondents' self-reported purchases



<sup>1</sup> Discount coupons were distributed in Borena for the January/ February 2013, 2014 and 2015 sales seasons and the August/September 2012, 2013, and 2014 sales seasons.

<sup>2</sup> IBLI was not sold in Marsabit in the August/September 2010 or January/February 2013 sales seasons for logistical reasons.

<sup>3</sup> Discount coupons were distributed for the January/February 2010, 2011, 2013, and August/September 2011, 2012, and 2013 sales seasons.

# Empirical strategy: ANACOVA



$$y_{i,u,t=T} = \beta^{0} + \beta^{1} y_{i,u,t=0} + \beta^{2} x_{i,u,t=0} + \beta^{LATE} IBLI_{i,u} + \varepsilon_{i,u,t=T}$$
(2.1)

$$IBLI_{i,u} = \alpha^{0} + \alpha^{1} y_{i,u,t=0} + \alpha^{2} x_{i,u,t=0} + \alpha^{2} Discount_{i,u} + \mu_{i,u}$$
(2.2)

Where:

i = household; u = index unit; t = 0 at baseline and t = T at endline

$$IBLI_{i,u} = \sum_{t \in [C]} I_{i,u,t}^{IBLI}, I_{i,u,t}^{IBLI} = 1 \ if \ IBLI_{i,u,t} > 0$$
(2.3)

$$Discount_{i,u} = \sum_{t \in [C]} I_{i,u,t}^{Discount}, I_{i,u,t}^{Discount} = 1 \text{ if } Discount_{i,u,t} > 0$$

$$(2.4)$$

$$C = \begin{bmatrix} 2010JF, 2011JF, 2011AS, 2012AS, 2013JF, 2013AS & in Kenya\\ 2012AS, 2013JF, 2013AS, 2014JF, 2014AS, 2015JF & in Ethiopia \end{bmatrix}$$
(2.5)



# Empirical strategy: ANACOVA



$$y_{i,u,t=T} = \beta^0 + \beta^1 y_{i,u,t=0} + \beta^2 x_{i,u,t=0} + \beta^{LATE} IBLI_{i,u} + \varepsilon_{i,u,t=T}$$
(2.1)

 y<sub>i,u,T</sub> = outcomes at endline ∈ {income/adult equivalent (AE), education, herd size, expenditures on livestock inputs, earnings from livestock sales}

How do purchases in 2010-2015 impact current outcomes many years later?

- Direct and dynamic impacts: Impacts of initial purchases change the household's trajectory (e.g., autocorrelation models, poverty trap models)
- Indirectly: Early purchases increase later purchases, which then impact later outcomes.



# Kenya: Survey implementation

- Baseline (N=924)
- Endline (N=868) targeted the 954 HHs that were in at least 2 survey rounds and had never exited the study.
- Analysis uses the 737 HHs that participated in all seven rounds of the survey so that we have full data on purchases (recall from each survey round).



# Kenya: Preliminary analysis of long-term impacts

	(1)	(2)	(3)	(4)	(5)
	Income <sup>1</sup> /	Max HH	Herd Size	Expenditures on	Earnings from
VARIABLES	AE	Education	(TLU)	livestock inputs <sup>1</sup> / TLU	livestock sales <sup>1</sup>
IBLI	2,697	0.956	-0.746	-61.63	-3,945
	(4,525)	(0.625)	(2.638)	(373.3)	(6,516)
Outcome at baseline	0.587***	0.808***	0.346***	0.777***	0.348***
	(0.0528)	(0.0362)	(0.0510)	(0.0510)	(0.0436)
FEs	Sublocation	Sublocation	Sublocation	Sublocation	Sublocation
Observations	712	712	712	712	712
R-squared	0.487	0.647	0.352	0.694	0.300
Kleibergen-Paap rk Wald F statistic	28.94	31.36	29.39	30.15	28.02
Baseline Mean	40,445	8.67	23.1	3,303	58,480

<sup>1</sup>Outcome is calculated using Kenya shillings and has been winsorized at the 99<sup>th</sup> percentile.

All standard errors are clustered at the sublocation level.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In the preliminary analysis, there is no evidence that the impacts of early IBLI purchases persisted 5+ years later.

Next steps

- Think carefully about how the observed early impacts would logically express 5+ years later if they had persisted.
- Endline in Ethiopia was collected in early 2022 and will be integrated into the analysis. This will increase power.
- Investigating ways that spillovers could have taken place, which could impact the strength of the IV and/or bias the impact estimates.





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