

Before and After the Drought
Global Evidence on the Impact of Agricultural Insurance
on Investment, Assets & Consumption

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Why Agricultural Insurance is Important

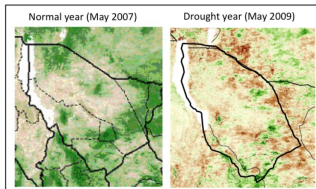
- We study agricultural insurance because there are decades of evidence that risk:
 - *Makes people poor* by reducing incomes & destroying assets & creditworthiness
 - *Keeps farmers from advancing*, by discouraging investment in risky but profitable activities
- Our hypothesis is that risk reduction through insurance should reverse this situation
 - By protecting households against the worst consequences of drought, insurance should in principal allow households to prudentially invest more in risky, but high returning agricultural activities.
 - That is, if insurance protects farmers assets & capital after the drought, it should also enable farmers to safely invest more before the drought (the “risk reduction dividend”)

- Evidence on the *before* and *after* the drought impacts of insurance is now emerging
- While still relatively sparse, the evidence is consistent in finding large impacts & a big “bang-for-the-buck”
- Zoom in on impact results from three I_4 studies:
 - Index-based Livestock Insurance (IBLI) protected consumption (for poorer households) and assets (for less poor households) *after a drought* in Northern Kenya
 - Cotton insurance in Mali induced substantial (*before the drought*) increased investment, production and income for small-scale farmers
 - Cotton insurance in Burkina has protected farmer's capital and creditworthiness after droughts, but so far has not increased farmer cotton investment before the drought, signaling the sensitivity of impacts to program implementation

Emerging Evidence on Microinsurance

- Empirical evidence to date on the effectiveness of microinsurance is modest, despite the large number of pilots that have sprouted up (interest by NGOs governments & aid agencies)
- Some evidence on *ex ante* effects, meaning insured take on riskier, higher return projects:
 - Karlan *et al.* (2015) find insurance intensifies ag production by 20% in Ghana
 - Similar results from Mobarak & Rosenzweig (2012) for India; Cai *et al.* (2015) for China; Cole *et al.* (2017) for India; and Jensen *et al.* (2017) for Kenya;
- To date, less evidence on *ex post* impacts despite theoretical predictions (de Nicola, 2011; Janzen *et al.*, 2018): Karlan *et al.* report reduced meal reduction; Bertram-Huemmer & Kraehnert (2017), Jensen *et al.* (2017) find insurance reduces livestock sales following a shock, del Valle *et al.* (2016) find that insurance in Mexico helps the lights come back on in Mexico
- Let's take a closer look at a several other studies

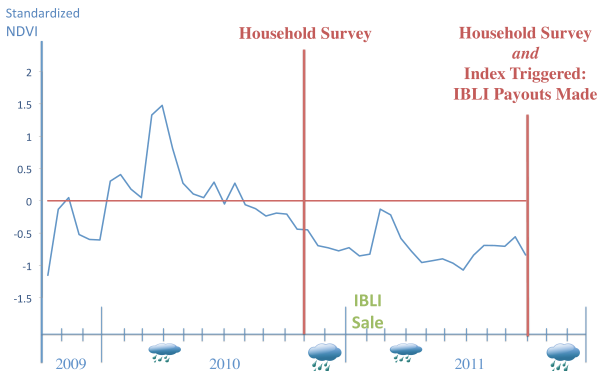
IBLI Experiment in Northern Kenya



- Drought insurance for livestock launched in January 2010
- International Livestock Research Institute, Cornell University, Syracuse University and I₄ at the University of California
- “Index-based”: uses satellite-based NDVI (normalized difference vegetation index) measures of available vegetative cover to predict livestock mortality
- Substantial training efforts
- Use of mobile payment technology to reduce costs
- Hassan Bashir, Richard Kyuma & Duncan Khalai will give more detail on these issues later today

Study Timeline

- Survey 673 Households in October 2011
- All households had access to insurance
- Individually randomized encouragement design
- 25% of households purchased insurance



Drought Coping

Variable	Average Response	By Livestock Wealth		
		Lowest Quartile	Highest Quartile	Difference in Means
<u>Asset Smoothing</u>				
Q3 Probability Reduce Meals (%) <i>(prior to payout)</i>	72 (1.7)	82 (3.0)	61 (3.8)	21*** (4.9)
Q4 Probability Reduce Meals (%) <i>(after receiving payout)</i>	62 (1.8)	72 (3.5)	51 (4.0)	21*** (5.3)
<u>Consumption Smoothing</u>				
Q3 Probability Sell Livestock (%) <i>(prior to payout)</i>	29 (1.7)	12 (2.6)	44 (3.9)	32*** (2.5)
Q4 Probability Sell Livestock (%) <i>(after receiving payout)</i>	27 (1.7)	12 (2.6)	42 (3.9)	30*** (4.7)
Observations	675	163	161	

Estimated AVERAGE Impacts of Insurance

Panel A: Meal Reduction

Insured	-0.12 (0.11)
Location fixed effects	yes
Observations	627
R-squared	0.21

Panel B: Livestock Sales

Insured	-0.61*** (0.16)
Location fixed effects	yes
Observations	627
R-squared	0.12

Cluster robust standard errors in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Differential Impacts, Meal Reduction

	Pre-established		GMM Estimated	
	Low <15	High >15	Low <9.3	High >9.3
Insured	-0.31** (0.16)	-0.05 (0.03)	-0.49** (0.23)	0.004 (0.17)
	-	-	[-.91, .03]	[-.36, .30]
Location effects	yes	yes	yes	yes
Observations	381	246	303	324
R-squared	0.26	0.23	-	-
Equality of Coeff	1.65**		1.72**	

Differential Impacts, Livestock Sales

	Pre-established		GMM Estimated	
	Low	High	Low	High
	<15	>15	<22.4	>22.4
Insured	-0.41**	-0.71***	-0.54***	-0.96***
	(0.20)	(0.16)	(0.17)	(0.24)
	-	-	[-.85, -.11]	[-1.46, -.47]
Location effects	yes	yes	no	no
Observations	381	246	459	168
R-squared	0.13	0.24	-	-
Equality of coeff	1.14		1.42*	

Standard errors in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Summary of 'After the Drought' Impacts in Kenya

- After a major drought in 2011, we found that insurance had the following impacts:
 - For the better off households insurance leads to a 82% drop in distress asset sales, allowing households to exit the drought with their more of their productive assets intact
 - For less well-off households (who were already doing everything they could to keep from losing their productive assets) insurance to a 40% drop meal reduction as a coping strategy
- Other studies have found that insurance caused livestock owning households to invest more in the quality of their herds (veterinary care, breeding stock)

Cotton Insurance Experiment in Mali



- Malian farmers pursue a diversified production strategy of growing their own food plus cotton
- Value chain credit via group loans, but consequences of default are substantial (informal collateral)
- Group cotton loans also discourage investment as the more a farmer produces, the more likely that some of his output will be 'taxed' away to pay for others in the group (could insurance assist the shift to individual loan contracts?)
- Farmers report that risk keep them from growing less cotton than they otherwise would, or by reducing financial risk exposure by investing less in the crop

Descriptive Statistics

	Control	Treatment
<i>Pre-intervention outcomes</i>		
Cotton area 2010 (hectares)	2.19	2.44
Cotton harvest 2010 (kg)	2316.6	2291.2
Cotton yield 2010 (kg/ha)	1053.1	914.6***
Area in foodgrains (hectares)	4.02	3.09
<i>Household characteristics</i>		
Household head age	54.9	55.1
Household head years of schooling	0.87	0.76
Household head is ethnically Bambara	0.61	0.65
Membership in cooperative (years)	8.09	8.70
Cooperative leader	0.25	0.22
Stone house	0.17	0.14
Private well	0.29	0.35

Impact Results

<i>Purchased insurance:</i>					
	Loans (kCFA)	Area (ha)	Grain Area (ha)	Inputs (kCFA)	Harvest (kg)
Insured	102.875 (65.251)	1.339** (0.612)	0.639 (0.645)	97.847*** (36.449)	944.8 (585.4)
Constant	74.002 (66.104)	0.148 (0.442)	1.379*** (0.660)	18.737 (26.057)	33.1 (644.9)
N	894	883	897	878	871
R2 (adj)	0.123	0.100	0.243	0.046	0.157
<i>Believe insured:</i>					
	Loans (kCFA)	Area (ha)	Grain Area (ha)	Inputs (kCFA)	Harvest (kg)
Individual believes insured	138.944 (89.144)	1.569* (0.852)	1.096 (0.908)	121.010** (52.570)	837.7 (775.325)
Constant	90.367 (65.346)	0.367 (0.456)	1.522** (0.646)	35.294 (26.680)	178.6 (672.7)
N	885	875	888	870	863
R2 (adj)	0.111	0.066	0.236	-0.042	0.164

Summary 'Before the Drought' Impacts in Mali

- Our I_4 study across the 2011/2012 period found that insurance caused the average farmer to:
 - To plant 1.25 hectares more in cotton
 - Borrow an additional 110,000 CFA which was invested in cotton inputs
 - Harvest almost 1 ton more of cotton
 - Not reduce area planted to maize and other grains
 - Boost family income by some 25%
- In other words, uninsured farmers are every year having lower family income as a way to manage risk
- Insurance allows farmers to earn that potential income!
- Good for value chain too

Cautionary Tale from Burkina Faso



- I₄ impact study in Houndé 2014-16
- Farmers report that 2015 insurance payments after a drought allowed them to continue in cotton business;
- Very positive despite delayed insurance payments
- But, unlike Mali find *zero* impacts on cotton investment & production
- Do find consequential impacts on investment in farm infrastructure, livestock and sesame production
- Lack of impacts on cotton production result of insurance sales being separated from loan process
- Farmers had to decide how much to plant and borrow before they knew if they had insurance

Cautionary Tale from Burkina Faso

- Cotton company (SOFITEX) and cotton union (UNPCB) scaling pilot up nation-wide
- But two challenges remain to make sure that cotton farmers and the cotton industry can benefit fully from high quality insurance
- First, we need to find a solution to this timing issues.
 - Farmers need to know if they will be insured at the time they make their borrowing and planting decisions
- Ssecond, to have impact, the insurance must be priced at a reasonable level relative to its value

Moving Forward in Tanzania

- As we will discuss later, two things can destroy the desirability of index insurance to the farmer:
 - 1 A contract that fails to pay when the village has losses
 - Fortunately, the area yield insurance contracts in West Africa meet this requirement, but not so for many contracts (as we will discuss later)
 - 2 However, if the total mark-up on the contract rises much above 50%, even high quality index insurance (like cotton insurance in Burkina) fails to meet a safe minimum quality standard and the farmer would be better off without insurance than with it

- Have seen that:
 - Index insurance can provide real protection to consumption & assets
 - “Risk reduction dividend” works in Mali
- This “risk reduction dividend” corroborated by a few other recent studies (Karlan *et al.*, Emmerick *et al.*)
- The challenge is to design fail-safe index insurance contracts and find the right mix of prudential regulation and public/private partnership to reap this dividend

Thank you!

