Innovations to Enhance the Economic Development Impacts of Index-based Insurance

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BASIS

Index Insurance 4 Innovation Initiative

The "Same Old Story" about Risk

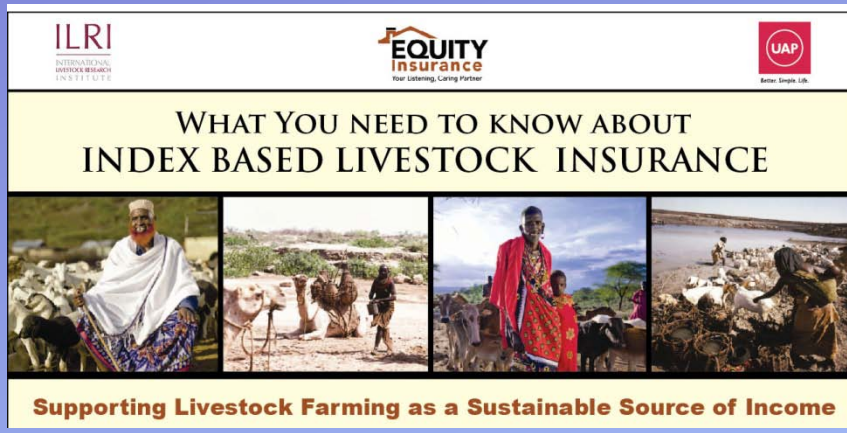
- The Director General of CIMYT, the international crop research center for maize and wheat, recently noted that small holders are currently only getting 30% of the yields potentially available with already existing technologies
- Why is this? Risk is a big part of the story
- Risk that is high and correlated across individuals creates a number of development problems for small farm agriculture:
  - Directly discourages investment in profitable, but costly innovations
  - Undercuts the development of agricultural credit markets, forcing families to rely on autarchic financial strategies, increasing liquidity constraints and further undercutting investment
  - Together these two forces undercut productivity, reduce growth and make people poorer than they need be given the available opportunities.
  - Finally, risk and the absence of deep credit markets create consumption variability that contributes to the inter-generational transmission of poverty, lessening the long-term human development impacts of even those incomes and growth that are achieved.

Crafting a new Ending to the "Same Old Story"

- The *I4 Index Insurance Innovation Initiative* begins with the idea that we can change the ending if we can change a key structural condition (uninsured, correlated risk) that underlies it
- A number of technical & financial innovations open the way for the innovation of index insurance contracts to transfer this correlated risk out of the system
- While remarkable progress on supply side of index insurance, the goal is not to sell insurance per se, but to solve the development problems of low growth and human vulnerability that make risk matter
- Remaining challenges are on the demand-side, creating the uptake, understanding & trust to change behavior and resolve the development problem, creating a new ending to the same old story

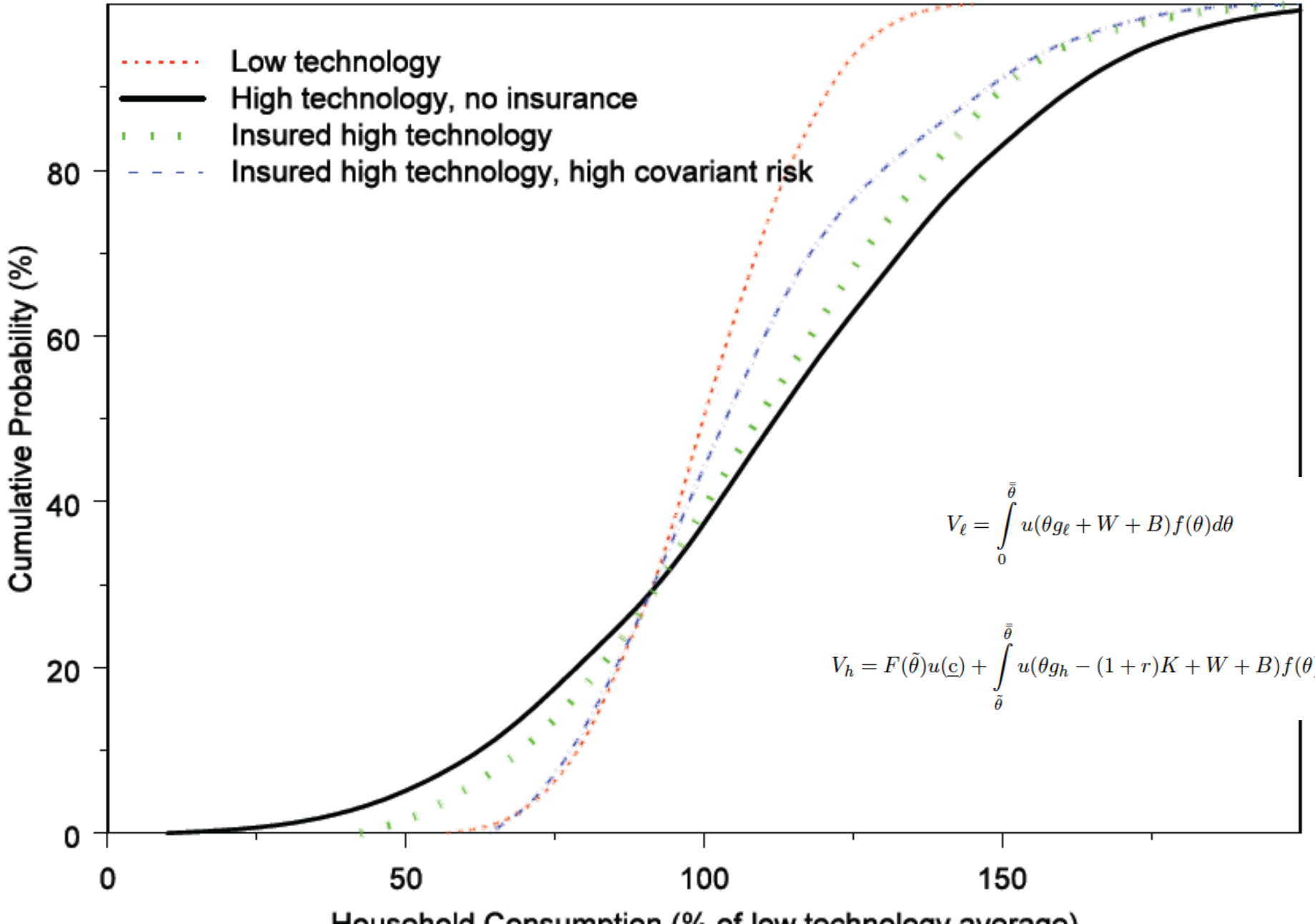
The I4 Index Insurance Innovation Agenda

- With generous funding from USAID and others, BASIS launched the I4 to design & implement index insurance pilots focused on boosting agricultural productivity & development impacts in:
  - *Small scale export agriculture* (Cotton in Mali & Peru, Coffee in Guatemala, Cacao in Cote d'Ivoire*)
  - *Small scale food agriculture* (Grains in Ethiopia; Rice in Ecuador; Maize in Tanzania*; Livestock in Ethiopia & Kenya)



- *I4 Demand-side Innovation Agenda:*
  - Interlinking risk reduction with opportunity expansion to create 'stochastic dominance'
  - Basis risk-reducing contracts
  - Designing & framing contracts from a farmer (not an economist!) perspective
  - Climate change
  - Education

Interlinking Risk Reduction with Opportunity Expansion



$$V_\ell = \int_0^{\bar{\theta}} u(\theta g_\ell + W + B) f(\theta) d\theta$$

$$V_h = F(\tilde{\theta}) u(\underline{c}) + \int_{\tilde{\theta}}^{\bar{\theta}} u(\theta g_h - (1+r)K + W + B) f(\theta) d\theta.$$

Interlinking Risk Reduction with Opportunity Expansion

- Insurance alone at market prices offers poor farmer an unpleasant tradeoff: Reduced variance in income at the cost of reduced average income
- However, the very fact that risk is a development issue (with the yield gap & money left on the table every year) suggests an escape from this tradeoff
- In theory interlinked credit-insurance that transfers correlated risk will:
  - Relax lender portfolio restrictions on ag loans that make credit scarce & expensive
  - Undercut the destructive political economy that creates debt amnesties
  - Eliminate risk rationing of borrowers
- Combined effect should be the ability to (stochastically) dominate traditional technology & self-insurance strategies with contracts that increase the mean & reduce the variance of farmer income & consumption streams

Interlinking Risk Reduction with Opportunity Expansion

- Ethiopian Project on Interlinking Insurance & Credit in Agriculture (EPIICA)
  - Led by FARMD speakers, Shukri Ahmed and Aleko Sarris along with Craig McIntosh
  - Addresses substantial yield gap for food grain farmers
    - Small fraction of farmers use improved varieties & fertilizers (despite demonstrations that can work)
    - Flimsy system of agricultural finance based on state banking that almost completely collapsed in 2009 following a drought
  - Working with Nyala Insurance to offer a rainfall-based index insurance contract
  - Contract has been used to coax in a new lender (Dashen Bank) that has never before offered agricultural loans
  - Bundled credit-insurance is marketed as ‘state contingent’ loan contracts to farmers
  - Loans marketed & bundled by local co-op
- Will it work? Like all I4 projects, implemented with a sophisticated impact evaluation strategy, so stay tuned!

Basis Risk-reducing Contract Design

- Basis risk refers to agricultural losses experienced by the household that are not correlated with the insurance index and are therefore uninsured by the index insurance contract.
- Higher basis risk means less insurance value for the individual producer
- There are two sources of basis risk:
  - *Purely idiosyncratic events* that are not correlated across individuals (e.g., animal damage or highly localized weather events)
  - Design effects such as choice of an insurance index (e.g., rainfall) that imperfectly correlates with average outcomes for a group of farmers
- I4 projects are piloting a number of approaches to minimizing this uncovered basis risk:
  - Use of micro data to select best index (rainfall, satellite, area yield) and design a statistically optimal predictor function
  - Double trigger contracts that employ indexes at multiple scales to simultaneously control moral hazard & slash basis risk
  - Complement index insurance with ‘gap insurance’ that covers basis risk by embedding index contracts into local social organizations
- Let’s examine these latter two ideas:

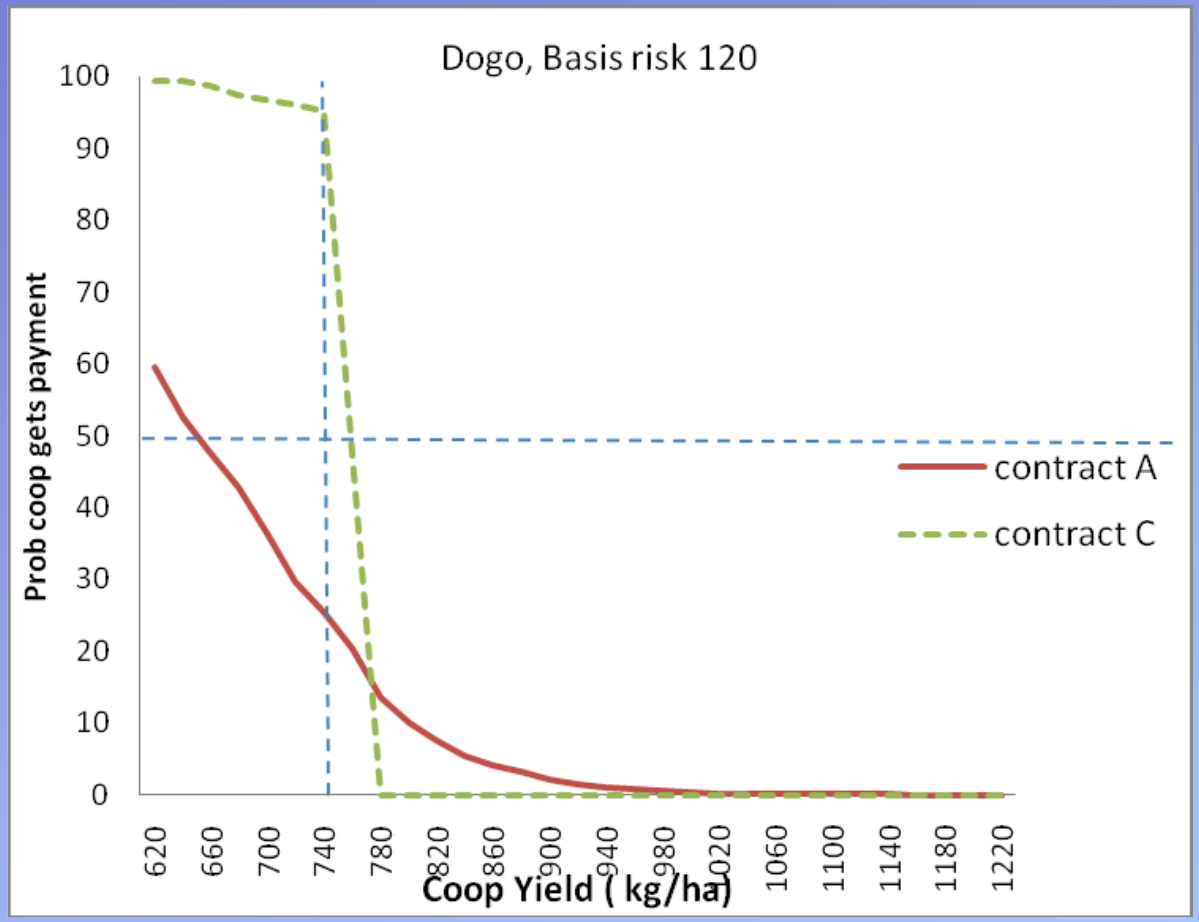
Basis Risk-reduction with Multi-scale, Multi-trigger Contracts

- The *Gueleya Nyesigi* project begins with same insight as Ethiopia project: Interlinking variance reduction with opportunity expansion
- In Mali, smallholders leave significant 'money on the table' every year by planting only 1 hectare in cotton
- An interlinked contract that crowds in supply & demand for credit for that 2nd hectare of cotton can create growth

- Extreme spatial variability in this sub-Sahelian zone means that even a normally high quality area yield contract set a the 'ZPA' level (a grouping of 6-10 villages) has high basis risk
- Farmers asked for a village-level yield index, but moral hazard too high at this spatial scale

Basis Risk-reduction with Multi-scale, Multi-trigger Contracts

- Why not employ multiple indexes at multiple scales to address both moral hazard & basis risk concerns?
- The first index is a village level area yield index with a trigger set at 750 kg (the point identified by farmers as their focal point)
- A second index, at the broader ZPA scale is set at a higher level (~950 kg) and serves as a moral hazard stick



- Contract only pays if both triggers strike
- Statistical analysis shows that this multi-scale contract radically can outperform a standard single scale (ZPA-level) area yield contract at LOWER cost

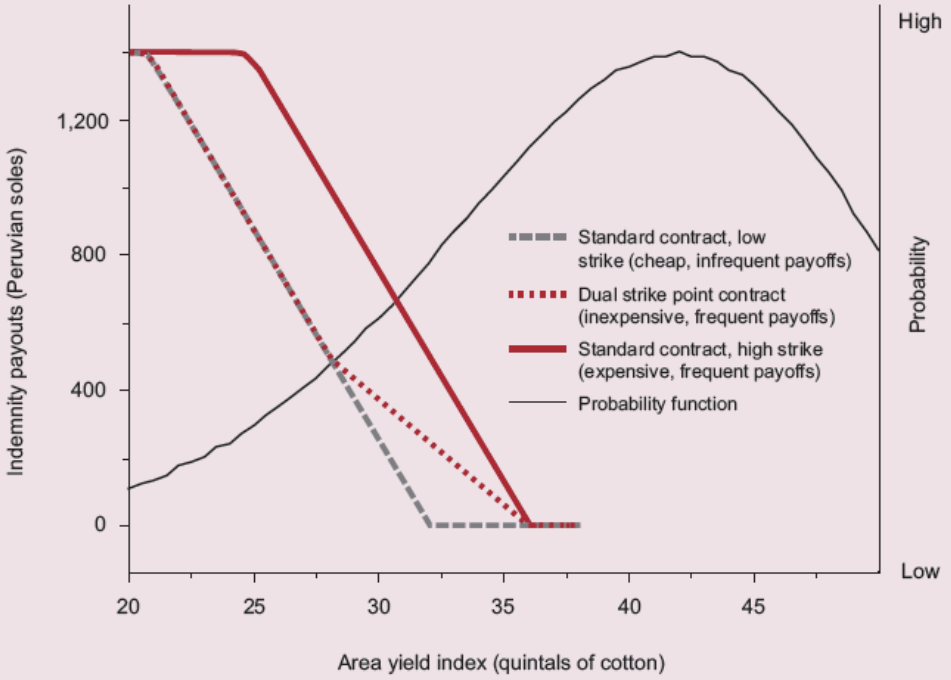
Basis Risk Reduction with 'Gap' Insurance

- An I4 project in Ethiopia is taking another approach to the basis risk problem by selling an index insurance to pre-existing risk management groups (*iddirs*, which traditionally operate as funeral societies)
- Rainfall contracts are used to insure *iddirs* against their correlated risks, but leave the *iddirs* free to use their local knowledge to redistribute index insurance payouts to those who are most hard hit
- *Iddirs* have the option to maintain a separate insurance fund to at least rebate index insurance premia for individuals hit by purely idiosyncratic shocks in years when there is not payout on the index contract
- Effectively, the *iddirs* offer a 'gap policy' for covering risks uninsured by the index contract
- Remains to be seen to be seen if these *iddirs* can manage the new responsibility, though in principal the index insurance should stabilize them financially
- In addition, from the perspective of 'behavioral economics,' this design should radically boost uptake, bringing us to our last area of I4 innovation …

Designing & Framing Contracts based on Farmer Understanding of Risk

- Diagram on right illustrates standard area yield contracts used in the first two years of an I4 project for Peruvian cotton farmers
- Farmers were offered a chance to secure their income (gains) from cotton production
- The standard linear contract (shown by the gray dashed line) met with tepid demand in the first year
- In the second year, an improved contract was introduced (dashed red line)

Figure 1—Dual strike-point contract



Source: Author's calculations.

- Economists loved the new contract; Demand by farmers was still tepid
- Forced a rethinking of how farmers think about risk

Designing & Framing Contracts based on Farmer Understanding of Risk

- It seems that farmers' reluctance is consistent with several behavioral paradoxes in which no one behaves as economists imagine
- Let's illustrate one such paradox:
  - A volunteer from the audience—thank you, Lena Heron of USAID!
  - *Problem 1*
  - I give Lena $10
  - Lena, you must choose which of the following lotteries you want to play:
    - *Lottery A:* Heads you get $10, Tails you get 0
    - *Lottery B:* Heads you get $5 and Tails you get $5
  - Lena, your choice, please …
  - *Problem 2*
  - I give Lena $20
  - Lena, you must choose which of the following lotteries you want to play:
    - *Lottery A'*: Heads you loose $10, Tails you loose 0
    - *Lottery B'*: Heads you loose $5 and Tails you loose $5
  - Lena, your choice, please ....

Designing & Framing Contracts based on Farmer Understanding of Risk

¿Cuánto es la Indemnización y cuánto cuesta?

La Positiva pagará una indemnización por hectáreas de acuerdo a la siguiente tabla:

Agropositiva Total

Rendimiento promedio anualizado (qq/ha)	Indemnización por hectárea (S/.)	Costo por hectárea (S/.)
Menos de 39 hasta 33	150	154
Menos de 33 hasta 26	750	
Menos de 26	1400	

Agropositiva

Rendimiento promedio anualizado (qq/ha)	Indemnización por hectárea (S/.)	Costo por hectárea (S/.)
Menos de 33 hasta 26	775	107
Menos de 26	1400	

Ejemplo del funcionamiento de Agropositiva:

Don Eusebio y Don Manuel compraron Agropositiva para el cultivo de algodón.

- Don Eusebio obtuvo un rendimiento 40 qq/ha y
- Don Manuel obtuvo un rendimiento de 27 qq/ha
- Si el rendimiento promedio del Valle de Pisco el 1 de julio del 2011 fuera 22 qq/ha, es decir menor que el índice de rendimiento de 39 qq/ha indicado en la Póliza.

Entonces tanto Don Eusebio como Don Manuel recibirán

Datos Importantes

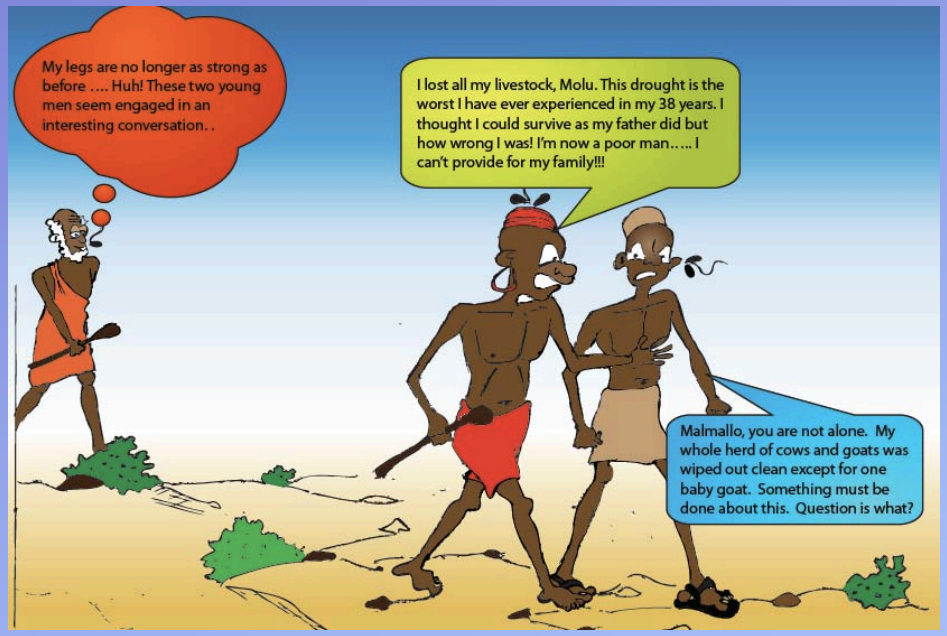
Si el Seguro Agrario para algodón hubiera existido desde la década pasada, La Positive hubiera pagado las siguientes indemnizaciones durante 16 campañas agrícolas:

Agropositiva Total

Campaña Agrícola	Rendimiento Promedio del Algodón en el Valle de Pisco (qq/ha)	Indemnización por hectárea (S/.)
1985-1986	37.5	150
1989-1990	36.5	150
1990-1991	30.1	775
1991-1992	47.9	775
1992-1993 (Fenómeno del Niño)	20.6	1400
1993-1994	36.2	775
1994-1995	33.9	150
1995-1996	34.8	150
1996-1997	33.2	150
1997-1998 (Fenómeno del Niño)	21.5	1400
1998-1999	29.3	775
1999-2000	35.0	150
2000-2001	38.3	150
2001-2002	36.5	150
2002-2003	37.4	150
2008-2009	38.6	150

In Conclusion …

- The bad news is that yield gaps remain a predominant feature of the small farm landscape in Africa, Asia & Latin America
- The good news is that yield gaps remain a predominant feature of the small farm landscape in Africa, Asia & Latin America
- It is perhaps this feature that most strongly distinguishes agriculture in Africa, Asia & Latin America from the reality of risk & insurance in the US & Europe
- While it is clearly important to invest in new agricultural technologies, also need to find ways to realize the underutilized potential of already existing agricultural technologies



- Innovative financial technologies offer an important complement to more conventional crop breeding and soil management programs
- Still much to learn to resolve demand-side challenges & resolving risk as a development problem