Promoting Resilience through Index Insurance: The Way Forward

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April 19, 2017

The Potential,

- Ample evidence that traditional insurance does not work for low wealth rural households (Ecuador)
- Modest evidence that index insurance can work:
  - *Before the Drought*
    - 20-30% bumps in investment when insured (Ghana, India, Mali)
  - *After the Drought*
    - Radical reductions in costly coping strategies (Kenya)

The Problem,

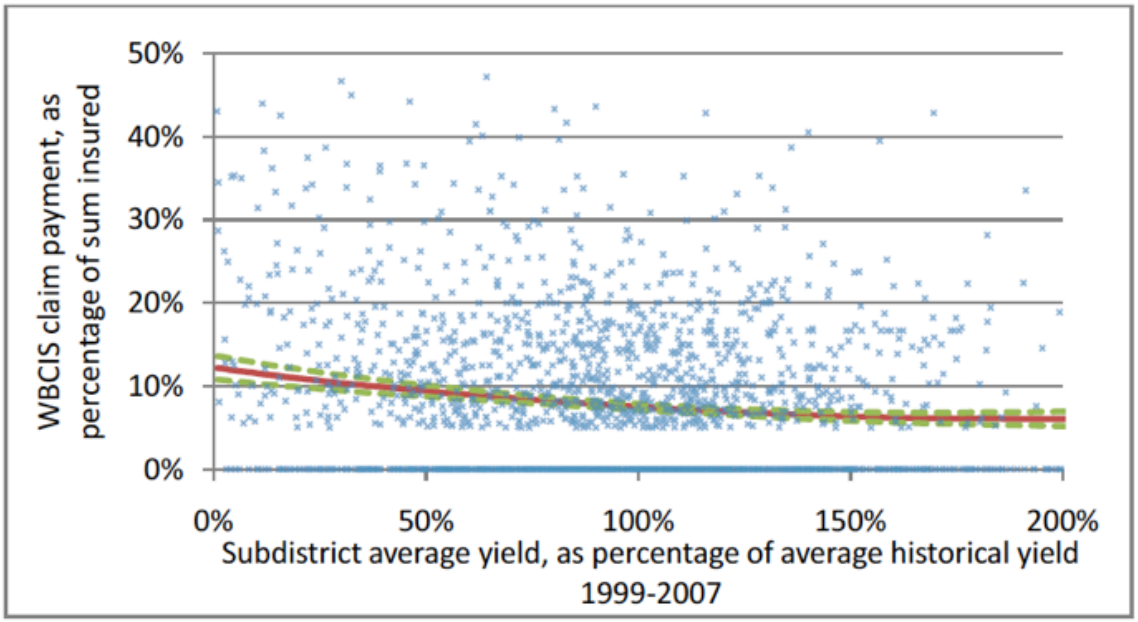
- But uptake of insurance is often low:
  - Low quality (failure prone)
  - High price;
  - Lack of trust in providers (the suits)
  - Lack of information on a complex, novel technology (learning hard)
  - Cash constraints to purchase
  - Behaviorally oddities (ambiguity aversion)
- Index insurance remains work in progress

& the Way Forward

- Our goal is to look forward & specifically focus on the sorts of things USAID might do to solve these problems
  - Invest in the development of high-quality insurance indices
  - Require that contracts Meet Safe Minimum Standards for Index Insurance Quality
  - Smart Subsidies that lower insurance costs & help make the market
  - Bundle with drought-tolerant agricultural technologies
  - Create flexible structures for savings and credit to complement and as appropriate replace insurance
  - Apply lessons from the microcredit revolution on outreach to low wealth clients

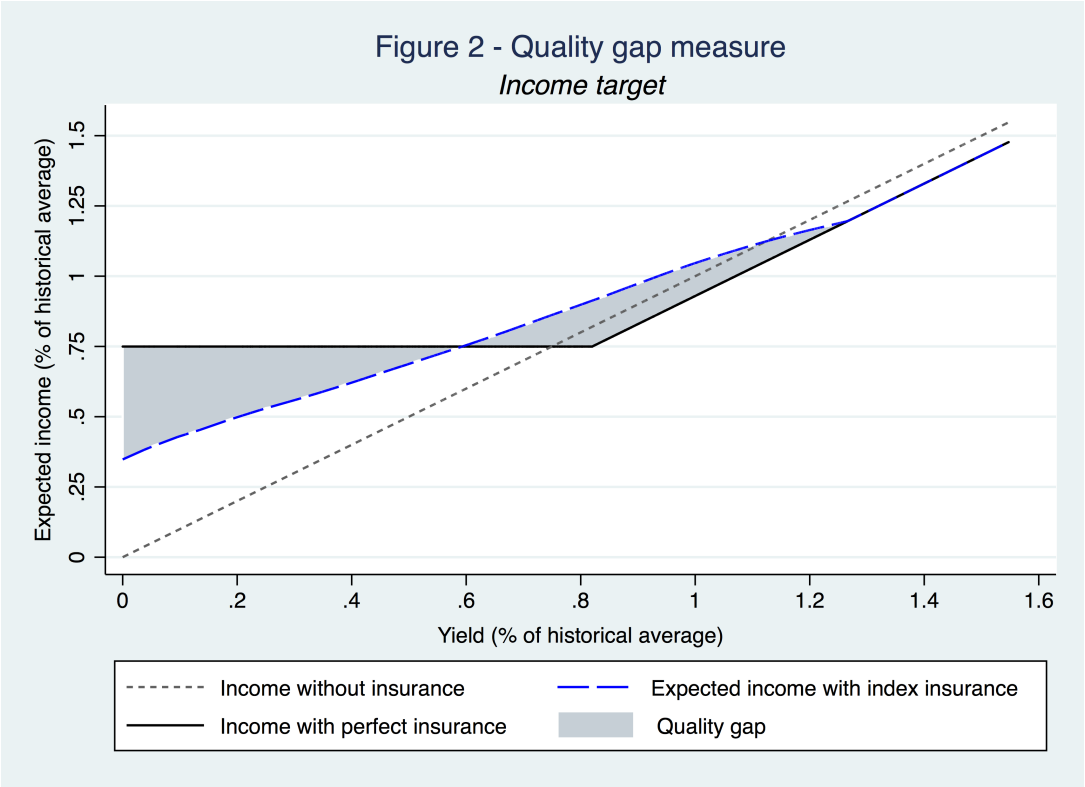
Quality Index Insurance

- Disappointed (angry) farmers & what are sometimes called "Basis Risk Events" have punctuated the importance of designing contracts that protect farmers
- The problem is far from trivial as the following analysis of the relationship between average losses and indemnity payments under rainfall insurance in India shows:

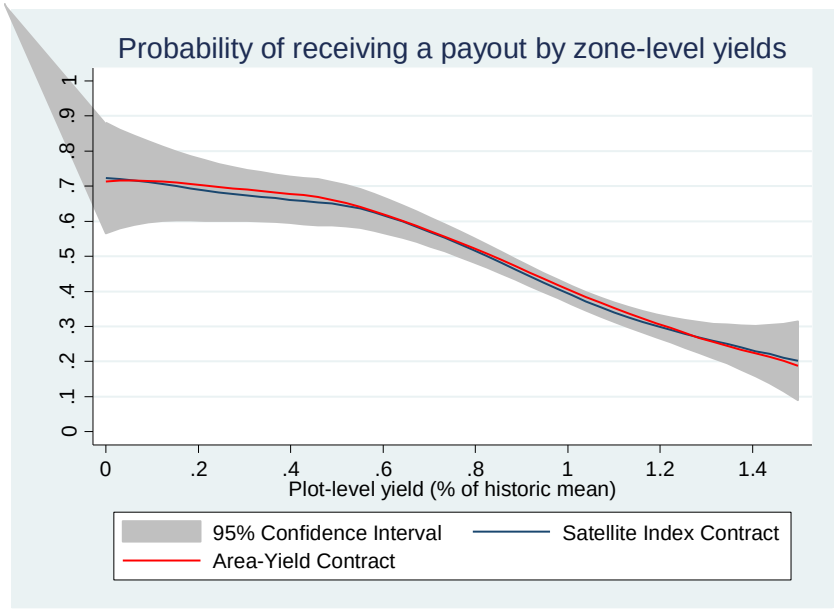


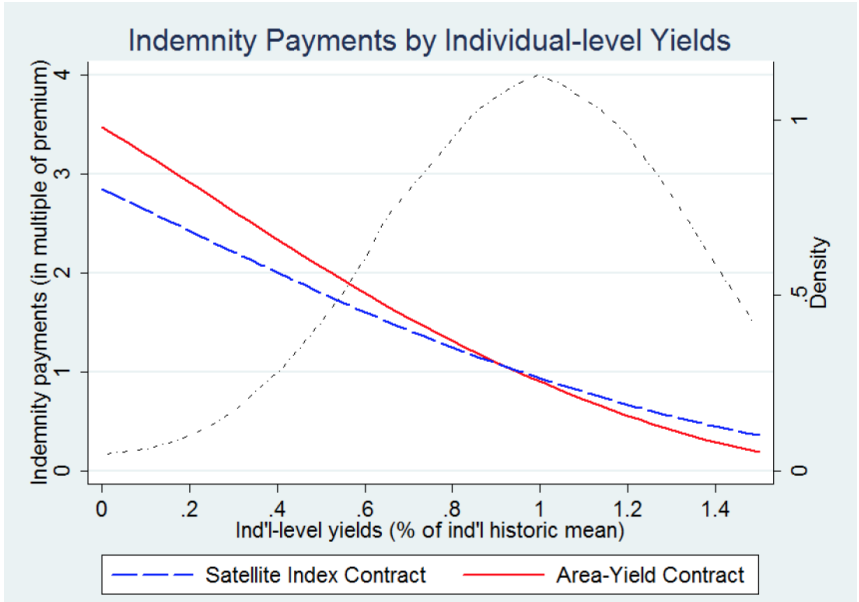
Quality Index Insurance

- A quality index insurance contract is one that:
  - Adequately protect farmers against income fluctuations; and,
  - Can achieve the objectives we seek in offering insurance to developing country farmers (income & consumption stabilization, & investment incentives)



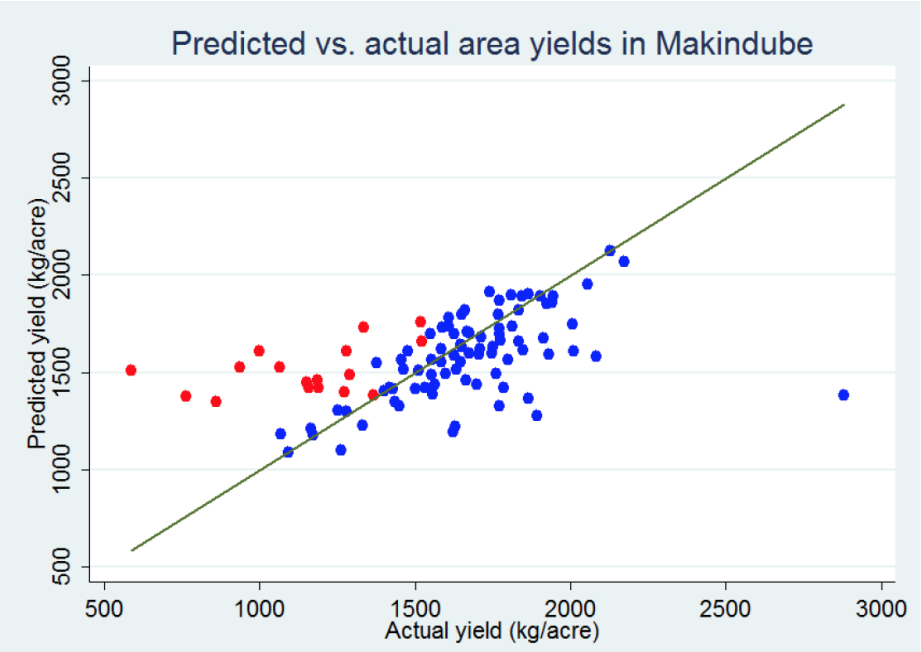
Quality Index Insurance–Sí se Puede





- Origins of this near area yield index
  - Ground truth-based design: For each small area ("village"), we collected 10 years of retrospective data on yields
  - Crop masking & planting date detection (machine learning)
  - Selection of based remote sensing predictor (mix of scale and measure: 'Gross Primary Production' (based on EVI, FPAR & LAI) at 250m x 250 m resolution

Quality Index Insurance–Sí se Puede



- Still not perfect (red dots show over-prediction errors)
  - Audit-based procedures
  - Underway now in a new project in Tanzania & Mozambique where estimate that will be needed 1 out of 5 loss events

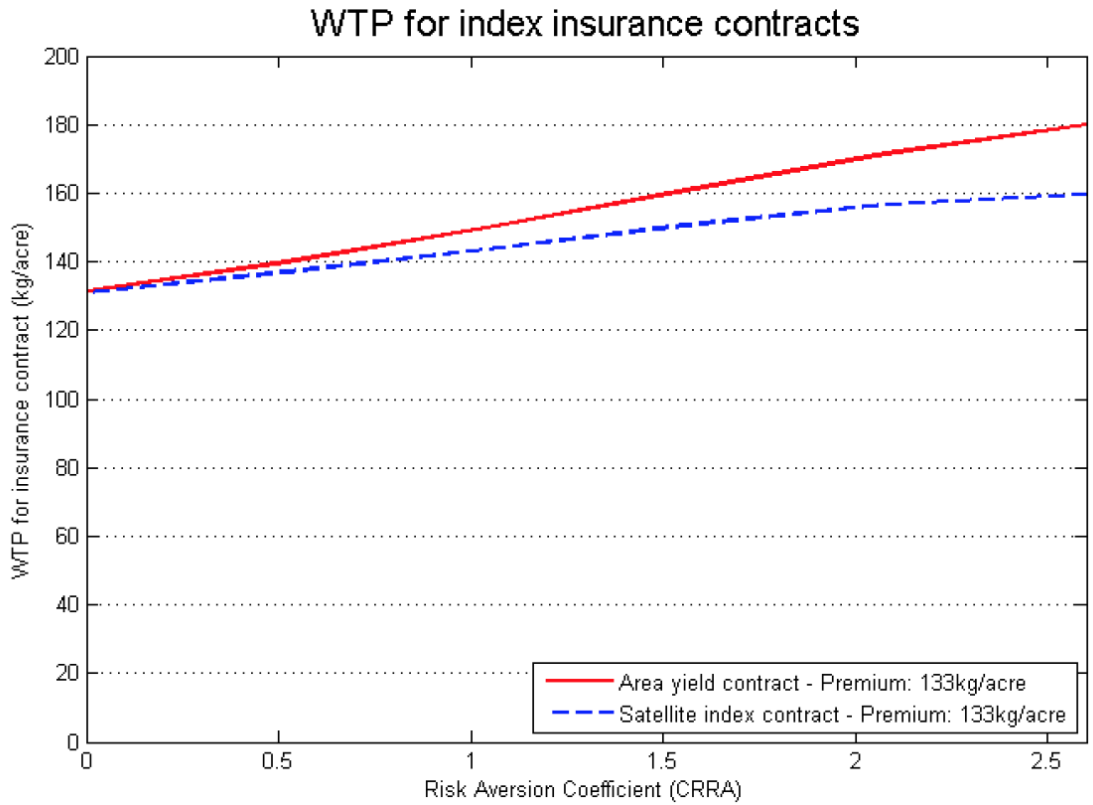
Safe Minimum Standard (SMS) for Index Insurance

- Like hybrid maize seeds, quality of index insurance :
  - Is a hidden trait
  - Costly to develop and supply
- Unlike hybrid seeds:
  - No defined & enforced quality standards (akin to germination & yield tests for seeds)
  - Takes many years for farmers to discern quality
- Given these characteristics, economic theory suggests unregulated market can reach a junk insurance equilibrium

SMS for Index Insurance

- Earlier graphics suggest elements for an index insurance quality measure
- A quality measure should reflect two things:
  - The probability that an insurance failure happens
  - The "value" of money when failure happens (money worth more when need it most)
- Standard economic theory can aggregate these two elements into a single a 'reservation' price measure defined as the maximum amount an individual could pay for a contract without making herself worse off
- The SMS:
  - *Reservation Price* > *Market Price*
- Under the GAN, we have developed a spreadsheet tool that can easily calculate whether a proposed contract meets the SMS *if* have the ground truth data to design a quality contract

SMS for Index Insurance



- Industry not yet pushing for such standards
- A first step might be for donors to demand that projects they fund meet the SMS

Insurance Pricing & Subsidies

- As SMS diagram shows, even quality index insurance cannot meet the SMS if price is marked up by much more than 40% of "actuarially fair price"
- While US crop insurance is marked up by ~27% (and then subsidized), not unusual in our projects to see mark-ups well above 50%
- Reasons behind these mark-up levels can be disputed, but clearly has some basis in concerns about data quality (sparse data problem) and climate change (unstable probability distributions)
- One interpretation is that these factors result in an uncertainty loading or mark-up

Insurance Pricing & Subsidies

- What is clear is that demand for, and impacts of, index insurance will be minimal at this price
- Been some tendency to simply to subsidize a highly marked-up price (the original GIIF program run by IFC)
- A smarter subsidy might be for a public entity to carry some of the "tail risk" (about which there is uncertainty) so that the overall price comes down
- A just announced GIIF program takes some first steps in this direction
- Also, can use subsidies to help make the market by providing a catastrophic level of protection
- Still much to be done to improve the use of subsidies so that index insurance can have its desired effects & promote resilience

Bundling index insurance with other risk-reducing instruments

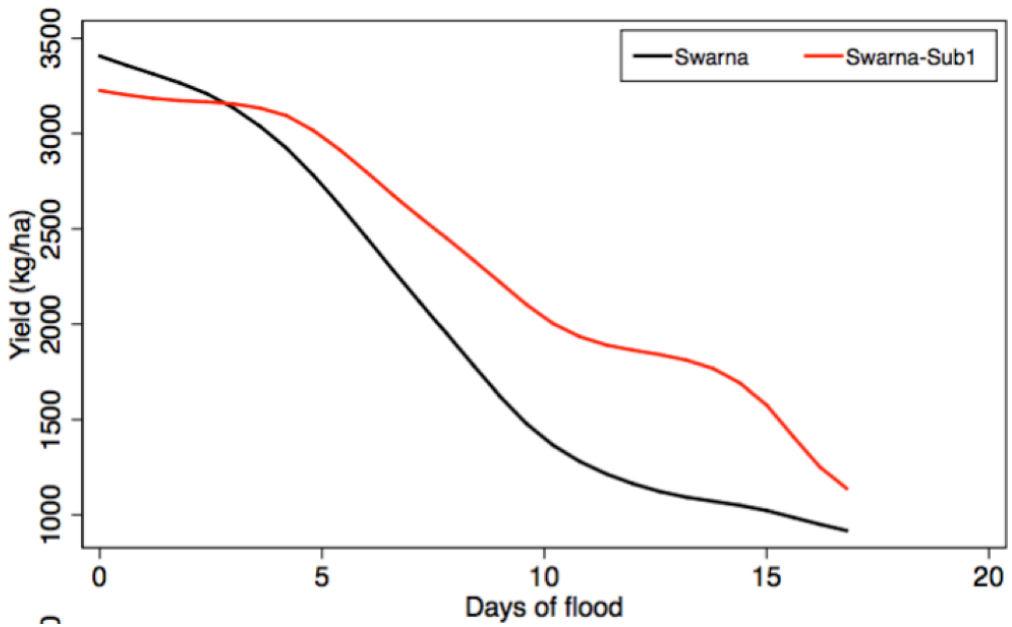
- Another major reason for low uptake of index insurance is that it has not been carefully used as part of a portfolio of risk-reducing instruments:
  - Stress resistant technologies,
  - Precautionary savings & other forms of self-insurance
  - Emergency loans, and index insurance
- Optimal mix depends on the frequency and severity of risks

Bundling index insurance with other risk-reducing instruments

Risk layers				
Frequency of event	**Severity of impact**	**Risk financing strategy**	**Ex-ante risk management (arranged before a disaster)**	**Ex-post shock coping (arranged after a disaster)**
Low	Major	Risk transfer	Social safety net	Discretionary aid
			Index insurance	
		Risk retention	Contingent pre-approved credit line	Emergency credit
			Resilient technology	Adjusted income strategy
High	Minor		Precautionary savings	Expenditure reallocation

Stress Resistant Technologies: Flood Tolerant Rice

- Use resilient technology for small shocks; use index insurance for larger shocks when technology fails
- Resilient technology has yield advantage in bad years (45% yield advantage after 10 day flood)



- But gain disappears after more severe 18 day flood
- Could employ index insurance as in new drought tolerant maize project

Stress Resistant Technologies: Flood Tolerant Rice

- In study of flood tolerant rice found that those with stress tolerant seeds:
  - Cultivate more land;
  - Used more fertilizer;
  - Adopted more labor-intensive planting methods;
  - Held less precautionary savings; and ,
  - Took more credit.
- As a result, those with stress tolerant seeds achieved higher yields in both flood and non-flood years, with expected gains in good years (3 in 4) about equal to avoided losses in bad years (1 in 4)
- On par with gains in studies of index insurance, but much cheaper

Flexible Savings & Credit Instruments to Complement Insurance: BRAC Emergency Loans

- Given the demand problems with index-insurance, BRAC Bangladesh offers an alternative way of helping their clients manage income risk
- Introduce a pre-approved index-based credit product designed to mimic index-insurance
  - Fits easily into BRAC's extensive microfinance operations
  - First iteration of the Emergency Loan is focused on flooding risk, the major source of agricultural income facing farmers in Bangladesh
- Objective: guarantee households liquidity after an income shock so they can quickly rebuild their income generating capacity

Flexible Savings & Credit Instruments to Complement Insurance: BRAC Emergency Loans

- Emergency loan properties Loan has three primary components:
  - Eligibility: Eligible for the emergency loan if has a qualifying credit score
  - Credit score based on borrower's past repayment behavior
  - Trigger: Loans only be made available once a pre-specified threshold (water level height) is passed
  - Flood water heights collected by Flood Forecasting and Warning Center
  - Pre-approval: Borrowers are told they are pre-approved for a loan should the trigger be passed
  - Borrowers can take up to 50% of their previously approved loan Can borrow whether or not have an outstanding loan
- Pre-approved credit complements index insurance

Flexible Savings & Credit Instruments to Complement Insurance: BRAC Emergency Loans

- *Advantages*–Removes many of the hypothesized drivers of low insurance demand:
  - No up-front premium required
  - No perceived loss if there is no shock
  - Clients don't "buy" anything, they are just informed about eligibility
  - Can "insure" many more clients than would otherwise buy an insurance product
- Drawbacks:
  - Inappropriate for large shocks that require a long recovery period (one year loans)
  - Multiple consecutive shocks can make loans unattractive
  - Only available to clients with credit history
- Insurance and credit are complementary in that they are most useful to different populations and for different types of risk

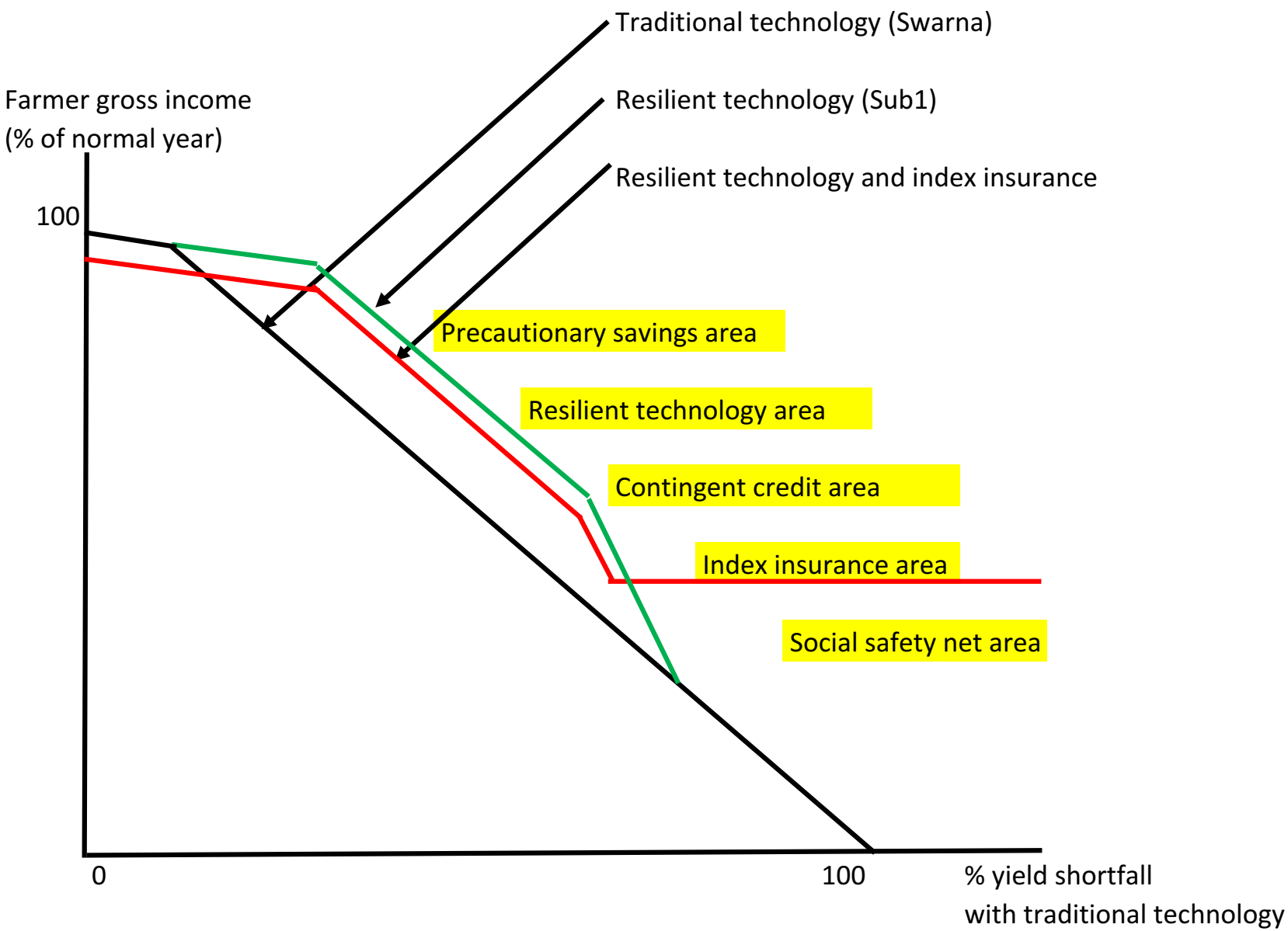
Flexible Savings & Credit Instruments to Complement Insurance: BRAC Emergency Loans

- Early Impact Results for Pre-approved Credit
- Successfully replicates many benefits found with index insurance
  - Risk management: Increase in agriculture investment among eligible BRAC clients: Increase in total cultivated land by 20% Intensification in input application (fertilizer and pesticide)
  - Shock coping: Improves recovery from income shock and helps preserve assets
  - Higher consumption per capita post-flood among eligible households
  - Eligible households maintain higher levels of livestock ownership

Learn from the Microfinance Revolution

- *Main lessons from microfinance:*
  - Microcredit increasingly customized to client circumstances:
  - Flexible collateral arrangements:
  - crops, warehouse receipts, assets purchased
  - Account for seasonal distribution of farmer income
  - Role of nudges and social incentives (joint liability)
- *Lessons for index insurance:*
  - Promote Village Insurance Savings Accounts (Nepal): dedicated savings for health and weather index insurance
  - Pay premium at time of delivery of product: part of contract with buyer of crop (used in cotton, dairy & sugar value chains/contract farming schemes)
  - Include index insurance premium in price of inputs (Syngenta)

A Portfolio Approach to Risk Management & Resilience



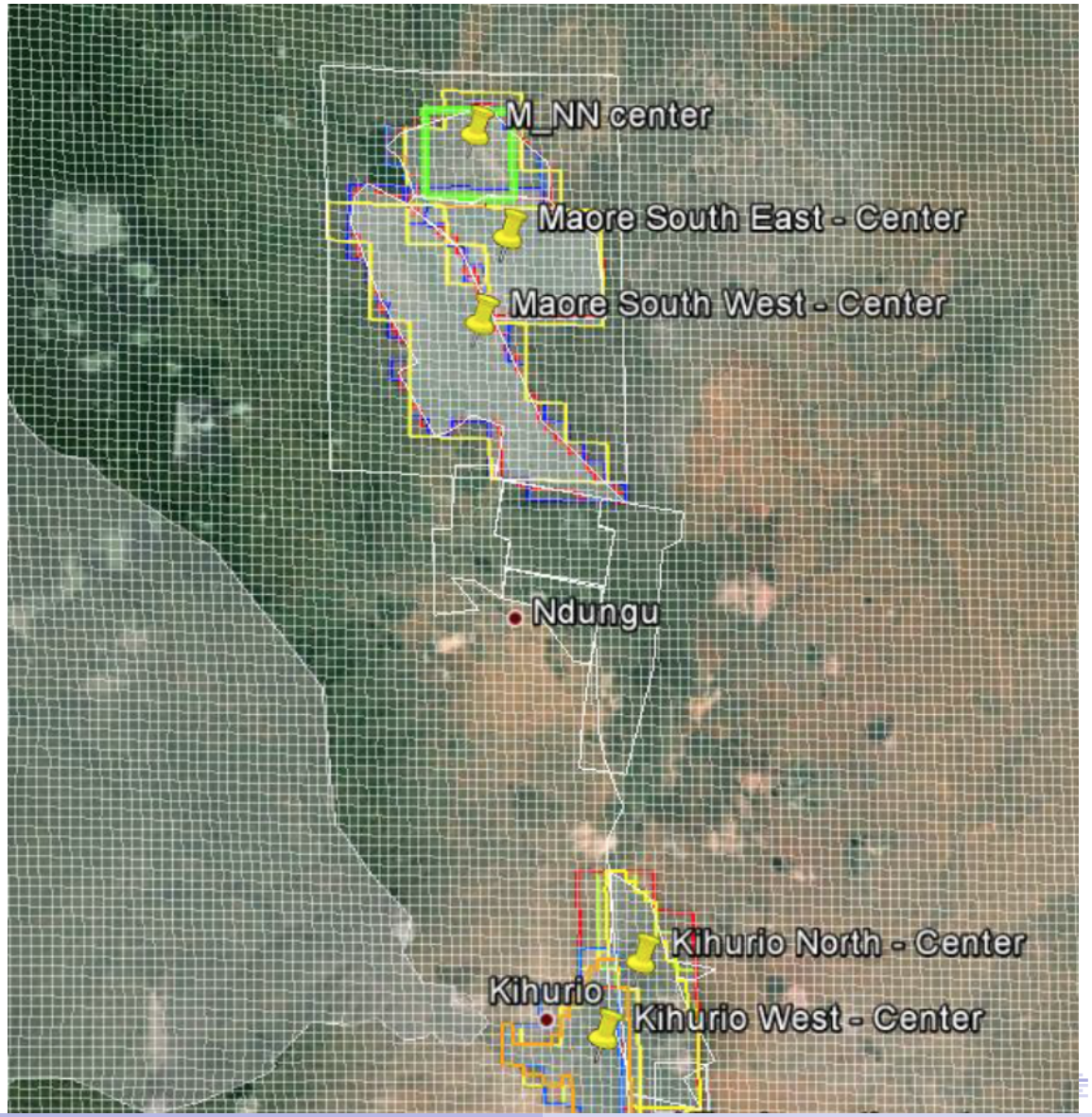
In Conclusion

- Problems of risk & resilience more powerful than ever
- Time to neither praise nor bury index insurance
- USAID & others can support efforts to improve the quality & price of index insurance
  - Quality & quality standards
  - Smarter subsidies & pricing
- Can also promote portfolio thinking which flexibly that combines financial and agronomic risk management technologies in flexible ways that evolve over time for individuals

Thank You!

Appendix Slides

Measuring Insurance Quality for Rice farmers in Northern Tanzania



BASIS AMA I4 Insurance projects

PROJECT & HIGHLIGHTS	YEAR	PAYOUT	PRIVATE SECTOR PARTNERS & SALES
Kenya—Livestock (IBLI) • Satellite-based contract • Business instability	2010-	No	• UAP & Takaful Insurance; Equity Bank & Swiss Re • 1979 contracts sold first year
• Significant impacts following 2011 drought • Payouts 2017	2011 & 2017	Yes	• Ups & downs on sales; strong last year • Increased reliance on digital technologies
Ethiopia—Livestock • Plans to link with climate change adaptation incentives	2012	No	• Oromia Insurance Company & Africa Re • 270 Policies Sold
Ethiopia—Grain Crops • Credit interlinkage/contingent repayment • Crowded in private credit supply (15 million birr, with 50 million promise) • Sparse data & difficulty getting approval for improved contract design	2012	No	• Dashen Bank, Nyala Insurance Company & Swiss Re • 25% uptake in study area • Negligible uptake outside study area where no discount vouchers
Ethiopia—Generic Weather Insurance • Gap Insurance back-up for basis risk	2011	No	• Buusaa Gonofaa (MFI) & Oromia Insurance
	2012	Yes	• Gap insurance crop cuts made, but not payoffs
	2013	TBD	• MFI will continue with gap insurance option • Market through *iddirs*
Ecuador • Individual insurance with shadow index contract (rice & maize) • Failure rates similar on individual & index • Dollar for dollar, index dominates individual insurance in terms of protection for farmers	2011-2013	Yes	• Government of Ecuador; QBE Colonial • Ford Foundation Funding

BASIS AMA I4 Insurance projects

PROJECT & HIGHLIGHTS	YEAR	PAYOUT	PRIVATE SECTOR PARTNERS & SALES
Bangladesh—Generic Flood Insurance	2013	TBD	• Palli Karma Sahak Foundation (PKSF) & MFIs
Mali/Burkina Faso—Cotton • Multi-scale contract • Behavioral experiments (ambiguity) • 33% uptake in pilot areas • Sparse data problems and reinsurance	2011	No	• Allianz—West Africa**, Swiss Re** & PlaNet Guarantee • 731 hectares insured** • 2012 military coup ended project in Mali • Moved To Burkina for 2013
• Experiments & framing variations on certain versus uncertain utility • Rollout to 1200 village co-ops 2014	2013-	Yes	• EcoBank, Sofitex & PlaNet Guarantee • Education & sales campaigns May-June 2013
Ghana—Grain crops • "Horse race" project to judge constraints • Demand elasticity analysis	2009-10	Yes	• "Soft insurance" • 1160 acres insured • Payout of $85/acre on about half of this area Insurance boosted area planted
	2011	No	• Transitioned to market-based product • Ghana Agricultural Insurance Program (GAIP) • 60% uptake in study area (655 policies sold) • Uptake 64% at subsidized price ($4), 56% at actuarially fair price ($8) and 40% at market price ($12)
Coffee—Guatemala & Colombia • Willingness to pay study & contract design • Index design & reinsurance problematic • Guatemala Failed • Colombia looking promising after outreach conference	20??	--	• Fedecocagua (Second tier association on cooperatives in Guatemala), La Ceiba Insurance • Coffee Federation (Juan Valdez!) & Ministry • MAPFRE • Mixed Contract

BASIS AMA I4 Insurance projects

PROJECT & HIGHLIGHTS	YEAR	RESEARCHERS & PARTNERS
Ghana • Credit supply focus & ag technological change • Moral Hazard & insurance beneficiary assignment	2014	• Mario Miranda (Ohio State) & Francis Mulangu (African Centre for Economic Transformation, Accra) • Ghana Agricultural Insurance Programme (GAIP, a private sector consortium)
Dominican Republic • Dairy (drought risk) • Credit interlinkage	20??	• Michael Carter, UC-Davis • Fundacion REDDOM • IRI Colombia, Guy Carpenter, SwissRe
Kenya • Insurance combined with contract farming • Paired with incentive/info interventions	2013	• Lorenzo Casaburi (Stanford) & Michael Kremer (Harvard) • Mumias Sugar Company
Bangladesh • Flexible financial services • Drought tolerant rice	2014-	• Elisabeth Sadoulet & Alain de Janvry (Berkeley) • BRAC parnership
Peru • Area yield cotton insurance • Bundled with loans with interest rate discount	2008-2010	• Michael Carter, Steve Boucher & Carolina Trivelli (IEP)
Tanzania • Ground-truthing satellite measures for rice & sunflower • Rollout as part of Vision fund ag loans	2014	• Michael Carter & Jon Einar Flatnes (UC-Davis) • World Vision & the SI software engineering firm
Mozambique • Bundled index insurance with DT (drought tolerant) maize • Fail-safe audit mechanism	2016-	• UC-Davis, CIMMYT & SARI • UAP Insurance in collaboration with 3 Seed Companies • Additional support for testing of high resolution image processing
Tanzania • Bundled index insurance with DT (drought tolerant) maize • Fail-safe audit mechanism		• UC-Davis & CIMMYT • Hollard Insurance in collaboration with K2 & Phoenix Seed • Additional support for testing of high resolution image processing