Minimum Quality Standards for Agricultural Index Insurance

Concepts & a Measurement Tool

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Quality Standards & Why They Matter

- Evidence that index insurance can have large, cost-effective development impacts:
  - *Before the Drought:* 20-30% increase in investment when insured (Ghana, India, Mali)
  - *After the Drought:* Significant reductions in costly coping strategies (Kenya)

- Despite these impacts, uptake of index insurance is often low for a number of interacting reasons, including failure-prone/low quality insurance;
  - Implies rational lack of trust in insurance;
  - May imply a behavioral allergy to failure-prone "probabilistic" insurance

- Some of these problems can be reduced by a clear definition and certification of quality standards

- Goal here is to lay out a Safe Minimum Standard intended to meet this need

Quality Standards for Index Insurance Are a Public Good Problem

- 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 (before & after)
- Like hybrid maize seeds, quality of index insurance :
    - Is a hidden trait (that is, the farmer cannot look at the contract paper & tell if it will protect her)
    - High quality is more costly to develop and supply high quality than low quality
- Unlike certified hybrid seeds:
    - No defined & enforced quality standards (akin to germination & yield tests for seeds)
    - Takes many years for farmers to discern quality (even harder than for maize seeds)
- Given these characteristics, economic theory suggests unregulated market can reach a junk equilibrium with low quality insurance and low demand

Defining Index Insurance Quality

- US Supreme Court Justice wrote that he could not define pornography, but knew when he saw it
- We need to do better than this for index insurance; whether quality is certified by insurance regulatory authorities (like maize seed) or whether it is certified by an independent private lab (akin to the Underwrite Labs for electrical devices), we need clear, conceptually sound minimum quality standard
- With your forbearance, I would like to use a simple numerical example to explain the quality problem and a minimum quality standard
- I will then give some real work examples of using the standard
- Later I can introduce a spreadsheet we have developed as part of the GAN 3D quality assessment tool package developed by the ILO

A Stylized Agricultural Setting

- Let's assume that a farm household can experience either a good year or a bad year:
    - Good years happen 80% of the time and the household earns $1000
    - Bad years happen 20% of the time and the household earns only $250
- The farm household can either go it along and absorb this risk, or it can buy an insurance contract designed to pay the family $400 in bad years
    - Let's initially assume a perfect insurance contract that always works, never fails and has zero basis risk
    - The "pure" or "actuarially fair" premium for this insurance will be the probability a payment is made (20%) times the amount paid ($400): 20% × $400 = $80
    - Let's assume that the market price of the insurance after a 50% markup (reinsurance, taxes, marketing and admin costs) will be 150% × $80 = $120

A Stylized Agricultural Setting

- The question we want to ask is:
    - *Would the farm household be better off going it alone without insurance, or would they be better off with insurance?*
- If the household would be better off economically buying insurance, then we will say that the insurance contract meets the Minimum Quality Standard (MQS)
- We will show in a minute that the answer to this household question is almost the same as a question a government might ask:
    - *Would a household be better off if we bought them insurance (100% subsidy), or would the household be better off if we just gave them the market price of the insurance as an annual cash transfer?*
- Let's look at a picture to fix ideas:

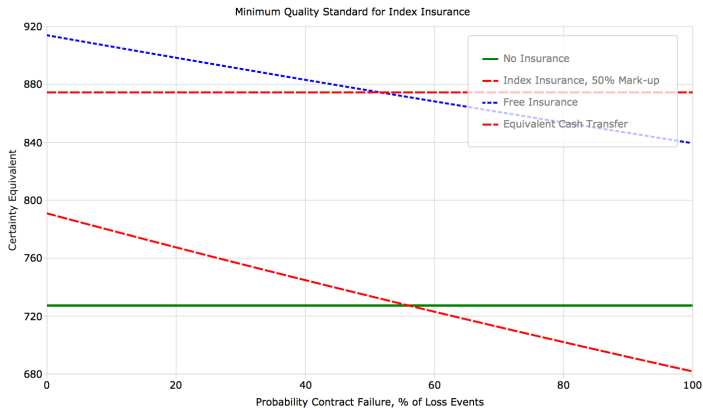# Go it Alone or Buy Insurance?

Income Levels with & without Insurance
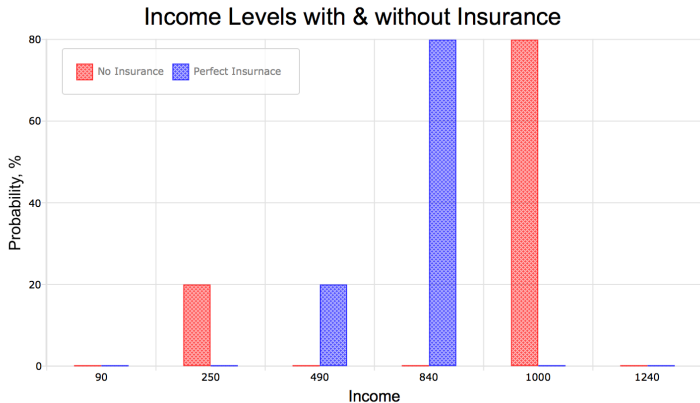
- Note that without insurance, average household income will be $850
- With perfect insurance, average income will be $810
- *Is lower income worth the stabilization effect of insurance?*

Go it Alone or Buy Insurance?

- *Is lower income worth the stabilization effect of insurance?*
    - It can be if a dollar in times of stress is worth more than a dollar in times of plenty?
    - In this case, will a farmer give up a $1.40 in times of plenty to have $1 in times of stress?
- Economists have a standard way of thinking about and measuring this: a person with higher "risk aversion" is willing to give up more in times of plenty to have that $1 in times of need
- Using our stylized agricultural economy, we can answer our core question for perfect insurance assuming a moderate level of risk aversion:

Perfect Insurance Exceeds the MQS!


Minimum Quality Standard for Index Insurance

- Perfect insurance has zero failure probability
- Measured well-being in certain income equivalent (*e.g.*, the go it alone strategy has an average income of $850, but its risk-discounted certainty equivalent is only $730)

What about Index Insurance

- Index insurance can be a great tool because it reduces administration costs that make conventional (loss-adjusted) insurance infeasible for small-scale farmers
- But, its achilles heal is that it sometimes fails farmers, not paying when the farmer truly has a loss that is not due to farmer negligence (*false negative*)
- It can also pay farmers when they have not had a loss (*false positive*)
- To keep things simpler, we will assume that the false negative probability equals the false positive probability
- We have seen that a risk averse farmer will be better off with perfect insurance rather than going it alone, even when insurance is marked up by 50%
- Let's examine whether a farmer would rather go it alone or have index insurance as we increase the failure rate for index insurance:

Go it Alone or Buy Index Insurance?


Income Levels with & without Insurance
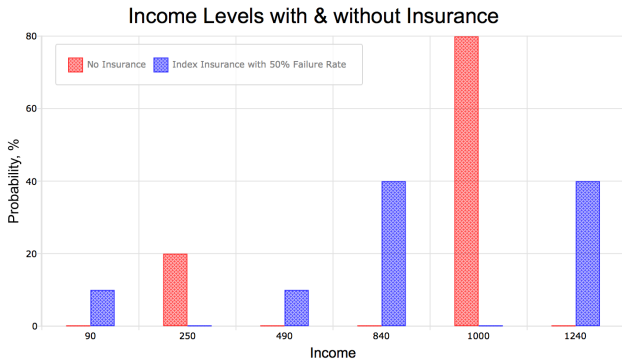
- Note that the worst thing that can happen gets worse with index insurance
- Note also that money is transferred from high value bad years to low values good years
- This is not free money! The farmer paid $1.50 for every dollar received, with a fraction of the dollars coming in bad years when the farmer really needed that money

Index Can Exceed the MQS if Failure Rate Not Too High
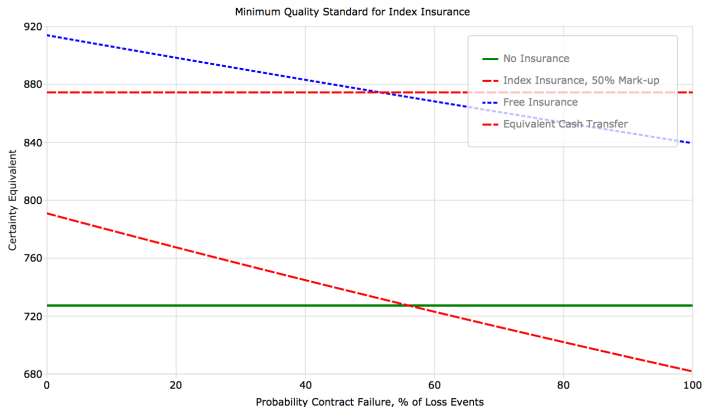
- In this example, if failure rate approaches 50%,, the farmer is better off going it alone
- Is 50% a high failure rate–not in the world of rainfall contracts
- For this reason, we feel like certification of MQS is needed

What about Subsidies?
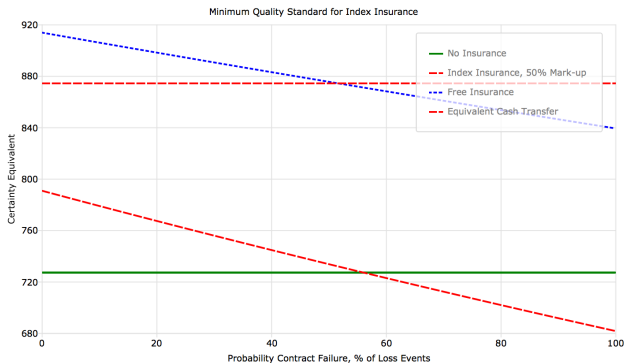
- Easy to say that who cares about MQS if the farmer does not pay because the insurance is subsidized
- That intuition is wrong
- Consider the following experiment: *would farmers rather have failure-prone insurance for free or be given the cost of the failure-prone insurance as an annual transfer?*
- Implications for smart public policy

- Lest we despair, we will return later to discuss contracts that bring down the failure rate and increase the economic value of insurance
- I do want to provoke us now to think about implementing MQS:
    - Private certification like Underwriters Lab (UL) or the ISO system
    - National insurance regulatory authorities
    - Public certification by a group like the ILO or the World Bank
- If we believe that risk matters that insurance can enhance development, then we must get serious about MQS lest a perfectly good tool and market get destroyed as the bad contracts drive out the good.

Practical Application of the MQS

- We looked at a stylized agricultural economy to explain MQS
- How do we do it in real life?
  - Farm (or at least insurance zone) level data on farmer outcomes across some number of years and farms/zones
  - Ability to retrospectively say if a contract under consideration would have paid in the past in each of those zones and years
  - Plug that information in the MQS spreadsheet
- Let's look at an example
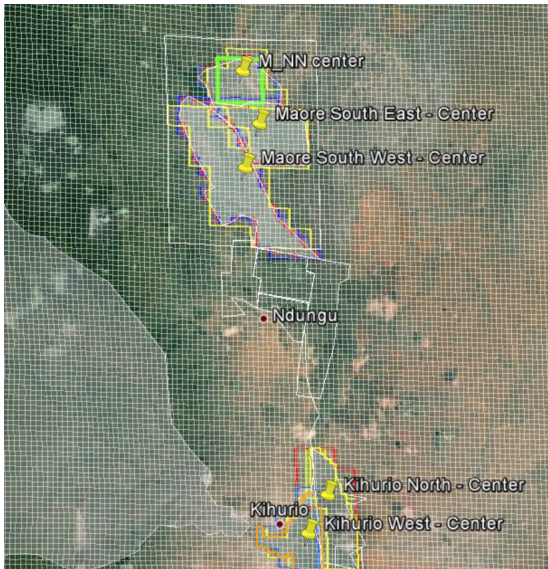
Backfitting the Contract

- For each small area ("village"), we collected 10 years of retrospective data on yields
- Best satellite predictor of village yields proved to be based on 'Gross Primary Production' (based on EVI, FPAR & LAI)
- Let's compare this (cheap to administer) satellite based index with an (expensive) village-level area yield contract:

Predicted vs. actual area yields in Makindube
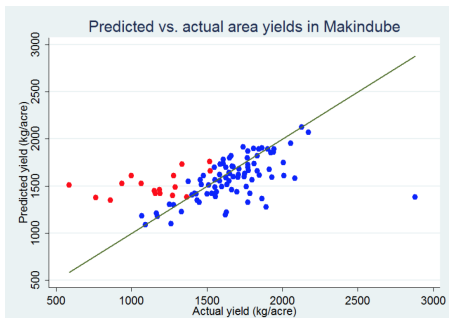
MQS in Action

- Actuarially fair prices for these contracts are 130 kg of rice per-hectare insured
- Unrealistically, assuming no local risk sharing
- MQS equivalent to WTP > Market Price of Contract

WTP for index insurance contracts