





Evidence in Agriculture: Risk

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Overview

- Introduction to ATAI
- Constraints in Agriculture
- Weather-based index insurance
- Risk-mitigating crops
- Conclusion



Around 65 Agriculture projects





Randomized evaluations provide the most rigorous estimate of program impact



Since the start of ATAI

Category	Total
Farmers surveyed	111,351
Female farmers surveyed	47,845
Farmers whose behavior has changed	17,932
ATAI Awards	55
Unique ATAI projects	42
Countries with ATAI projects	14
Researchers on ATAI projects	89

Cereal Yields (Metric Tons/Hectare)



Fertilizer Use (Kilograms/Hectare)



What is hampering technology adoption?

Inefficiencies constraining tech adoption

- 1. Credit markets
- 2. Risk markets
- 3. Information
- 4. Externalities
- 5. Input and output markets
- 6. Labor markets
- 7. Land markets

- I. Introduction to ATAI
- II. Constraints in Agriculture
- III. Weather-based index insurance
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- V. Conclusion



Preview: risk

- Risk matters
 - Farmers make conservative production decisions to self-insure
- Low demand for micro-insurance
 - In particular weather index insurance
- Search for alternative approaches to risk mitigation
 - Promising early results on risk-mitigating crops

How does risk constrain adoption?

- Agriculture is inherently risky activity
 - Weather and disease risks are aggregate, affecting all farmers in geographic area
- Farmers may lose large portion of harvest to extreme weather event
- Without any way to mitigate or insure risks, investment in crops or technologies appears to be an unsafe gamble
 - Higher-value crops may also be more sensitive to weather
- Exacerbated by risk aversion and ambiguity aversion

Protecting farmers through formal insurance

- Agricultural insurance to hedge risk ubiquitous in developed countries
 - Large number of small farmers, poor regulatory environments make most traditional products ill-suited to smallholders
- Weather index insurance as innovation to insure smallholders
 - Payouts made on observable variable (e.g. rainfall)
 - Avoids some disadvantages of conventional insurance: lengthy claims process, adverse selection, moral hazard
 - But has basis risk: official observation does not accurately predict farmers' losses

Stylized index insurance payout schedule



Rainfall (mm)

Major drawback to index insurance: basis risk

STYLIZED DEPICTION OF BASIS RISK



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A decade of experimentation on weather index insurance

- 10 randomized evaluations in various contexts
 - India, Ethiopia, Ghana, Malawi
 - Differences in crops insured, conditions that triggered payout, etc.
 - Effects of discounts, other encouragements to purchase insurance
 - Effects on production decisions



<u>J-PAL 2016</u>

Demand was low at market prices but increased with large discounts



Karlan et al 2013; Mobarak & Rosenzweig 2012; "Make it Rain"

Insured farmers took more risks on their farms

- When given subsidized insurance, farmers took on greater production risks
 - Andhra Pradesh: Fewer subsistence crops, more cash crops
 - Ghana: More land planted to maize, greater fertilizer use
 - Tamil Nadu: Shift from drought-tolerant varieties to high-yield varieties
 - China: Insurance for sows caused farmers to move into this risky but highly profitable crop

Cai et al. 2015; Cai 2013; Cole et al 2014; Karlan et al. 2013; Mobarak & Rosenzweig 2014

Can we improve demand for insurance?

- In series of experiments in Gujarat and Andhra Pradesh researchers tested:
 - Demand for insurance under a number of marketing techniques
 - Effect of financial literacy training
 - Demand for insurance over several seasons



Variations on training, marketing, and product design had modest effects on take-up

- Relatively low take-up with video and flyer marketing
- Financial literacy training
 - Increased take-up
 - Not cost-effective
- Trust and experiential learning
 - Mixed results on endorsements
 - Observing payouts over time increased take-up (converse also true)
- Group risk-sharing
 - Some evidence that presence of informal risk-sharing networks increased demand

Cole et al 2014; Dercon et al, 2014; Gaurav et al 2011; Karlan et al 2014; Mobarak & Rosenzweig 2012

Interlinking WII with credit

- Why not address both credit and risk constraints simultaneously?
 - Demand side: Alleviate risk rationing and bring more individuals into the credit market
 - Supply side: Crowd in credit supply if portfolio exposure to weather risk limits lending
- No evidence that interlinking insurance and credit works well



Conclusions on WII

- When farmers have insurance, they take more risks on their farms
- However, still clear that risk is a major constraint for smallholder farmers
 - Especially weather risk
- Low demand for weather index insurance as commercial product
 - Price, distrust, lack of financial literacy, basis risk
- So where do we go from here?

An alternative: risk-mitigating crops and technologies

- Agricultural R&D on varieties that tolerate flood, drought, salinity
 - Increasingly important with climate change
- Swarna-Sub1 is a flood-tolerant rice variety
 - No yield penalty in normal conditions
 - Researchers tested effect in reallife conditions in Odisha, India



Flood tolerant rice



Farmers given flood-tolerant rice invested more in their farms



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Farmers given Swarna-Sub1 invested more

- Farmers given Swarna-Sub1 had higher yields in 2011 floods
- Farmers invested more in their farms
 - Cultivated more land
 - Applied more fertilizer
 - Switched to more effective, but higher-labor techniques

Scale-up would benefit marginalized populations the most



Note: Error bars represent 95% confidence intervals. Stars (*) note statistical significance from control group.

Summary: Risk

- Risk is a constraint for smallholder farmers
 - Especially weather risk
- Low demand for weather index insurance as commercial product
 - Price, distrust, lack of financial literacy, basis risk
- Alternatives to help farmers manage risk
 - Rethink insurance: provide subsidized policies as cash transfer or sell to institutions
 - Promising preliminary results on risk-mitigating crops







Thank you!

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