State of the evidence and research gaps in agricultural insurance and climate risk

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Impacts of weather shocks on livelihoods

LESS VULNERABLE

POVERTY CYCLE

LOWER INCOME
Global warming: Worsening vulnerability to food insecurity

Change in Hunger and Climate Vulnerability Index at 2°C global warming

Source: Betts *et al.* (Phil. Trans. R. Soc. A, 2018).
Agricultural insurance

Traditional indemnity-based insurance:
- High administrative and transaction costs.
- Asymmetric information between insured and insurer, which in turn gives rise to adverse selection and moral hazard.

Index-based insurance to overcome these challenges:
- Trials on weather index insurance show that index insurance can lead to higher investments in risky cash crops.
- Weather index-based insurance in Ghana (Karlan et al., 2014) and India (Cole et al., 2014; Mobarak and Rosenzweig, 2014)
- Livestock insurance using remotely sensed vegetation index: Kenya & Ethiopia (Jensen, Barrett and Mude, 2015)
- Hybrid index product in Bangladesh (Vargas Hill et al., 2019)
Yet, low demand even at low premiums

De Bock and Galade, 2012 (review); Cole et al., 2013; Mobarak and Rosenzweig 2014 (India); Karlan et al., 2014 (Ghana). Adapted from IPA.
Major challenge: Basis Risk

Weather based crop insurance payouts against yields in India

Note: The lines show the point estimate and 95% confidence intervals for an Epanechnikov kernel with a bandwidth of 0.8.

Innovations to reduce basis risk

Three innovations in presentation today:

• Fail-safe contract design with audits (design risk)
• Ground pictures to reduce information asymmetries (spatial risk)
• Crop models for smarter index design (temporal risk)

Thursday session “Research for scaling agri insurance”

• Crowdsourcing to collect additional ground data
• Bundling insurance with stress-tolerant seed varieties
• Impact evaluations of innovations in agricultural insurance
Fail-safe contract design with audits

Reducing basis risk: Allowing farmers to request audits when index fails (Berhane et al., 2015; Flatnes & Carter, 2016; Vargas Hill et al., 2019)

Challenges:

• Cost of conditional audit and risk of delays
• Limited farmer engagement and participation
• Idiosyncratic risks that don’t affect an area at large

Figure adapted from Flatnes, Carter and Mercovich (2018), presented at ICAE 2018
Basis Risk in Area Yield Insurance

Simulated area-yield based payouts against yield categories

Source: Crop cutting experiments data for 50 villages in Haryana and Punjab (Ceballos, Kramer and Robles, 2018).
Picture-Based Insurance (PBI)

1. Mobile application
2. Farmer using phone
3. Crop monitoring
4. Data analysis
5. Degree of damage:
   - 0-19% (none/mild)
   - 20-49% (moderate)
   - 50-74% (severe)
   - 75-100% (extreme)

   % of sum insured:
   - 0%
   - 35%
   - 65%
   - 100%
6. Insurance claim
Experiment on PBI in northwest India

Source: Crop cutting experiments data for 50 villages in Haryana and Punjab (Ceballos, Kramer and Robles, 2018).
Crop models for smarter index design

Feed observed growth stage and other agronomic information into crop models to predict weather-related production losses.

Note: ‘Gcc’ stands for green chromatic coordinate, with its value normalized by the maximum gcc for the site. See details in Hufkens et al. (2018)
Research gaps for such innovations

• Implications for **service quality** and **consumer demand**?
  ▪ What are the estimated impacts (investments, income and assets, but also consumption, consumption smoothing, and ultimately welfare)?

• To what extent does use of technology affect **gender inclusivity**?

• Does technology give rise to new **distribution channels**?
  ▪ New form of insurance to be offered by telecoms?
  ▪ Bundling with digital credit and savings, mobile money?

• **Broader risk management**—how to avoid crowding out of risk prevention and climate adaptation / CSA?
  ▪ Technology reduces information asymmetries: climate-smart subsidies?
  ▪ Unlock credit required to invest in CSA practices and technologies?
Thank you!

Questions & Answers