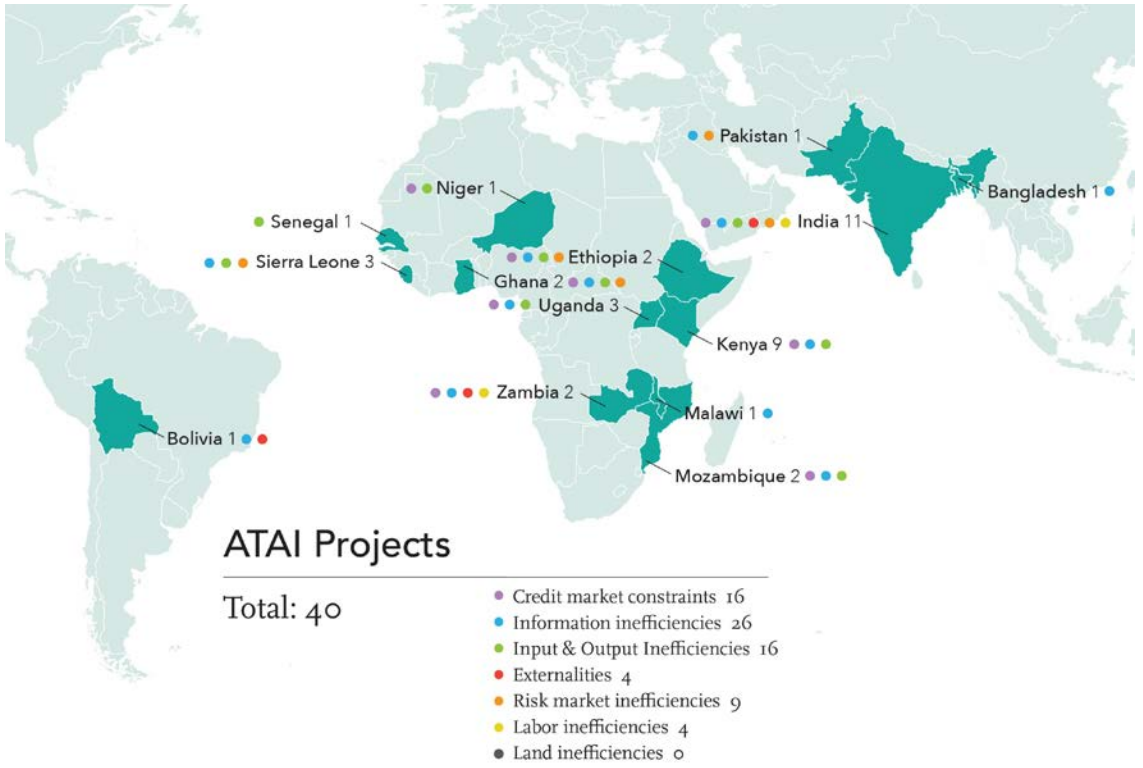
Agricultural Technology Adoption Initiative Policy Insights

Evidence-based insights on agricultural technology adoption in the developing world

ATAI Background

- The mission of the Agricultural Technology Adoption Initiative (ATAI) is to develop and rigorously test programs that improve the adoption and profitable use of agricultural technology by small-scale farmers in South Asia and Sub-Saharan Africa.
- ATAI is a collaboration between researchers at MIT's Abdul Latif Jameel Poverty Action Lab (J-PAL) and UC Berkeley's Center for Effective Global Action (CEGA).
- ATAI funds well designed randomized controlled trials (RCTs) that tell us what is most effective in promoting profitable agricultural technology adoption or the impact technology adoption has on smallholder farmers' lives.
- With generous support from DFID and the Bill and Melinda Gates Foundation, **ATAI has funded 40 unique projects** and affected thousands of smallholder farms throughout South Asia and Africa.



I. Policy Insights: Credit & Savings

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Policy Insights: Credit and Savings

Credit and Savings: Context

- Standard microfinance-type capital is often unavailable to or inappropriate for farmers.
- Banks often do not lend to the agricultural sector.
  - Without liquid capital, farmers are constrained in their ability to invest optimally in productivity-enhancing agricultural technologies or practices.

Credit & Savings: Evidence-based Insights

- Access to capital has been proven to affect agricultural activity, yet take up of credit products is generally low
- Lack of credit is unlikely *the* primary constraint to agricultural investment
  - Increasing credit in isolation from addressing the risk that farmers face is unlikely to be effective in encouraging agricultural technology adoption
- Some strategies have proven effective in increasing smallholders' access to liquidity
  - Improved information about borrowers improves credit market performance
  - Flexible collateral arrangements like crop inventory or asset-collateralization
  - Accounting for farmers' seasonal distribution of income
    - Using crops as collateral (harvest inventory credit schemes), savings (storage solutions)
    - Allowing farmers to delay repayment of a loan until after harvest and/or helping farmers save for inputs at planting time can increase purchase of inputs.
    - Labels or commitment devices to allocate resources for certain times
- Evidence from 18 studies

Ashraf et al. 2006, Banerjee et al. 2013, Basu & Wong 2012, Beaman et al. 2014, Boucher et al. 2008, Burke 2014, Carter et al. 2013, Casaburi et al. 2014 Crepon et al. 2015, De Janvry 2010, De Laat et al. forthcoming, Duflo et al. 2008, Fink et al. 2014, Gine et al. 2010, Gine et al. 2011, Karlan et al. 2010, Matsumoto et al. 2013, Tarozzi et al. 2013

Credit & Savings: Emphasis for Future Research

- Lending products using flexible collateral (leasing)
  - Encourage loan take-up while providing well-timed access to capital
- Credit, savings, storage, etc. products based on timing in the agricultural cycle
  - Financial products which account for seasonal fluctuations in farmer liquidity, optimal investment in inputs and crop and input prices.
- Institutions that can bolster information about borrowers (credit bureaus, fingerprinting)
  - Facilitate dynamic incentives to improve credit market performance where social guarantees of repayment are undermined by aggregate risks.

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Policy Insights: Risk

Risk: Context

- Systematic risks of agricultural production play an important role in farmers' agricultural investment decisions.
  - Weather, natural disasters, pests , and disease can jeopardize farmers' ability to recoup their investments at harvest
  - Risks can depress productive input use
- Risk mitigating strategies for smallholders, such as insurance and stress-tolerant inputs, can impact yields and farmer welfare

Risk: Evidence-based Insights

- Standalone weather index insurance can increase risk-taking in production decisions, but has limited commercial viability at market prices.
  - Index insurance products suffer from low demand at market prices.
    - 16% average take up at full market prices, and a 50% subsidy only increases demand to 38%
  - Linking credit with insurance has mixed results and suffers from low demand
  - Demand for insurance increases when farmers observe payouts over time
  - Improving financial literacy and understanding of an insurance product increases take-up, but the cost of the training is much higher than the full cost of premiums.
  - Adopting insurance can increase risk-taking in production decisions.
- New risk-mitigating crop varieties provide a promising alternative to insurance that can reduce farmers' risk and produce higher yields
- Evidence from 13 studies

Cai et al. 2010, Cai 2013, Cole et al. 2013, Cole et al. 2014, Dar et al. 2013, Gine & Yang 2009, Gunnsteinson 2014, Janzen & Carter 2013, Karlan et al. 2010, Karlan et al. 2012,, McIntosh et al. 2013, Mobarak & Rosenzwig 2012, Mobarak & Rosenzwig 2014

Risk: Emphasis for Future Research

- Risk-protective seeds and technology
  - Achieve the benefits of insurance to farmers while decreasing aggregate exposure of agricultural system to weather
- Meso-level insurance
  - Focus on supply side by providing insurance to institutions (financial or governmental) that are exposed to weather risk
- Use of free insurance as a form of social protection
  - May be able to achieve a multiplier effect by releasing farmers' production decisions from risk constraints
- Strategies to reduce basis risk in index insurance products
  - Offer index insurance to groups who already provide informal risk pooling for idiosyncratic risks
  - Improving data to more closely align index triggers and experienced losses at the farm level

Carter et al. 2014, Dercon et al. 2012, Mobarak & Rosenzwig 2012

Risk: Citations

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Policy Insights: Information

Information: Context

- Farmers face a range of potential production technologies and practices to choose from. Information helps famers assess novel technologies, their risk profile and potential profitability
- A farmer's decision to adopt a new technology requires several types of information:
  - That it exists
  - Something about its benefits and costs
  - How to use it effectively

Information: Evidence-based Insights

- Agricultural extension is the most common model to transmit information to farmers, but the use of traditional extension services is low.
  - Extension services have sometimes been ineffective because they promote a technology that is unprofitable.
  - However, extension may be effective when providing information on a profitable practice that overcomes a behavioral bias like procrastination.
- Adapting the pedagogical model can impact agricultural activity
  - Information that is more easily accessible or more tailored to individual farmers at a given moment in time can be effective in changing practices.
  - Trainers are more effective at improving technology adoption when incentivized.
  - Farmers may be more likely to follow advice from someone similar to them or from multiple people in their network.
- Training can be effective in increasing adoption in the context of new or novel technologies such as risk reducing seeds.
- Evidence from 13 studies

Beaman et al. 2015, BenYishay & Mobarak 2014, BenYishay et al. 2015, Blair et al. 2013, Casaburi et al. 2014, Cole & Fernando 2012, Duflo et al. 2008, Duflo et al. forthcoming, Hanna et al. 2012, Islam 2014, Kondylis et al. 2014, Tjernstrom 2015, Waddington et al. 2014

Information: Emphasis for Future Research

- Information provision in the context of the adoption of novel technology
  - Focus training efforts on things that farmers wouldn't already be able to figure out: unobservable traits, novel technologies.
- Making targeting more efficient using information networks
  - Information networks are important for driving adoption, so target training efforts on 'central individuals'.
- Mechanisms to tailor information more precisely to individual farmers' contexts
  - Precision agriculture: disaggregate blanket recommendations, move to tailored extension advice based on local soil quality, crop requirements.

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Policy Insights: Input/Output Markets

Input/Output Markets: Context

- In sub-Saharan Africa, farmers often operate in shallow markets where investing in inputs and technologies that increase yields may not increase farmer profit.
  - Poorly linked markets mean that farmers may receive lower prices from local markets flooded with increased supply.
- Increasing farmers' access to deeper output markets may open opportunities to improve profits and increase farmers uptake of inputs that improve yields.
- If information constraints prevent farmers from knowing prevailing prices at different markets, accessing price information could lead to much larger profits by farmers.

Input/Output Markets: Evidence-based Insights

- Simply providing price information to farmers is unlikely to have significant effects on farmer incomes or price levels.
  - Information alone does not give farmers strong bargaining power in the presence of high transport costs.
- Yet providing price information to intermediaries or producers with direct access to markets, market prices converge and producers may benefit.
- Evidence from 5 studies

Aker 2010, Fafchamps & Minten 2012, Goyal 2010, Jensen 2007, Mitra et al. 2015

Input/Output Markets: Emphasis for Future Research

- Is lacking infrastructure a primary barrier to agricultural technology adoption?
- Do enforceable contracts between farmers and purchasers improve supply chains with benefits to farmers and/or traders?
  - Contract farming may create economies of scale and could facilitate access to technologies, financial services, and output markets.
- Does crop quality information get passed along the value chain and are higher-quality outputs rewarded?
  - Buyers and sellers may not trust each other, and/or farmers may be most strongly rewarded by quantity rather than quality. Evidence on value chain dynamics could help explain low investment in quality-enhancing technologies.
- RCTs that can identify if/how market shallowness (markets where large orders lead to significant price fluctuations) may be a significant constraint to positive investment.

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Thank you

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