Looking Back, Looking Forward: Insights for Agricultural Development & Transformation

Tavneet Suri, ATAI Board Officer

ATAI Donor Convening

Looking back: ATAI 1.0

What is hampering technology adoption?

Technology adoption key to productivity improvements in agriculture and hence an important input to transformation in the agricultural sector

ATAI: explaining the adoption puzzle

Three mediating factors (ABCs) and seven constraints to adoption

ABCs:

- Assets: land markets, property rights
- Behavior: farmers and intermediaries as economic agents
- Context/agricultural systems

Constraints to technology adoption

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

What is impact research?

What is impact research?

Identifying causalities in explaining outcomes

Difficult to establish from observational data

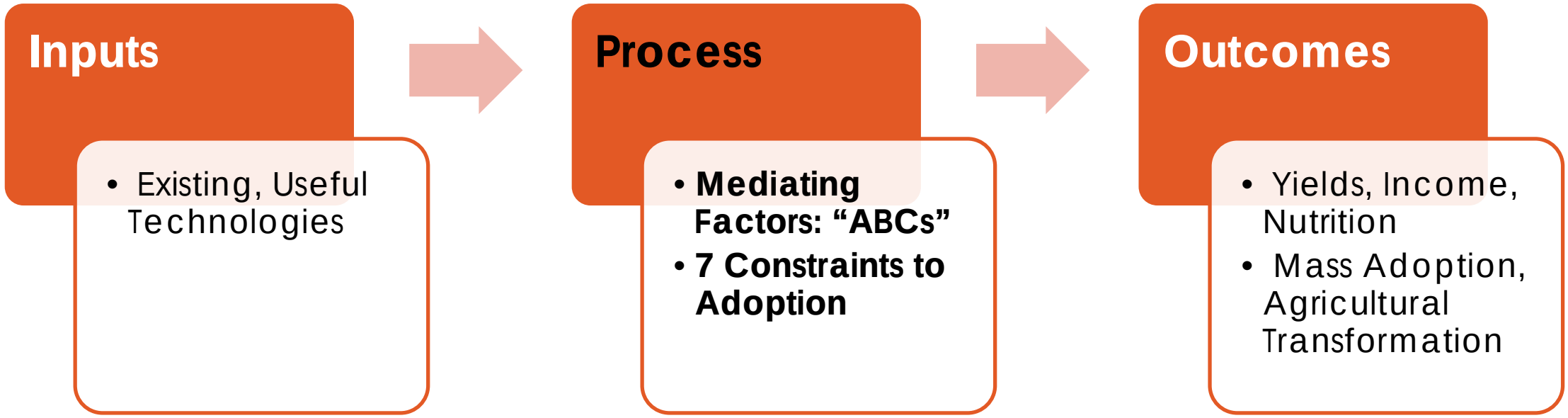
X→Y? or X←Y? or X&Y (i.e. correlation)?

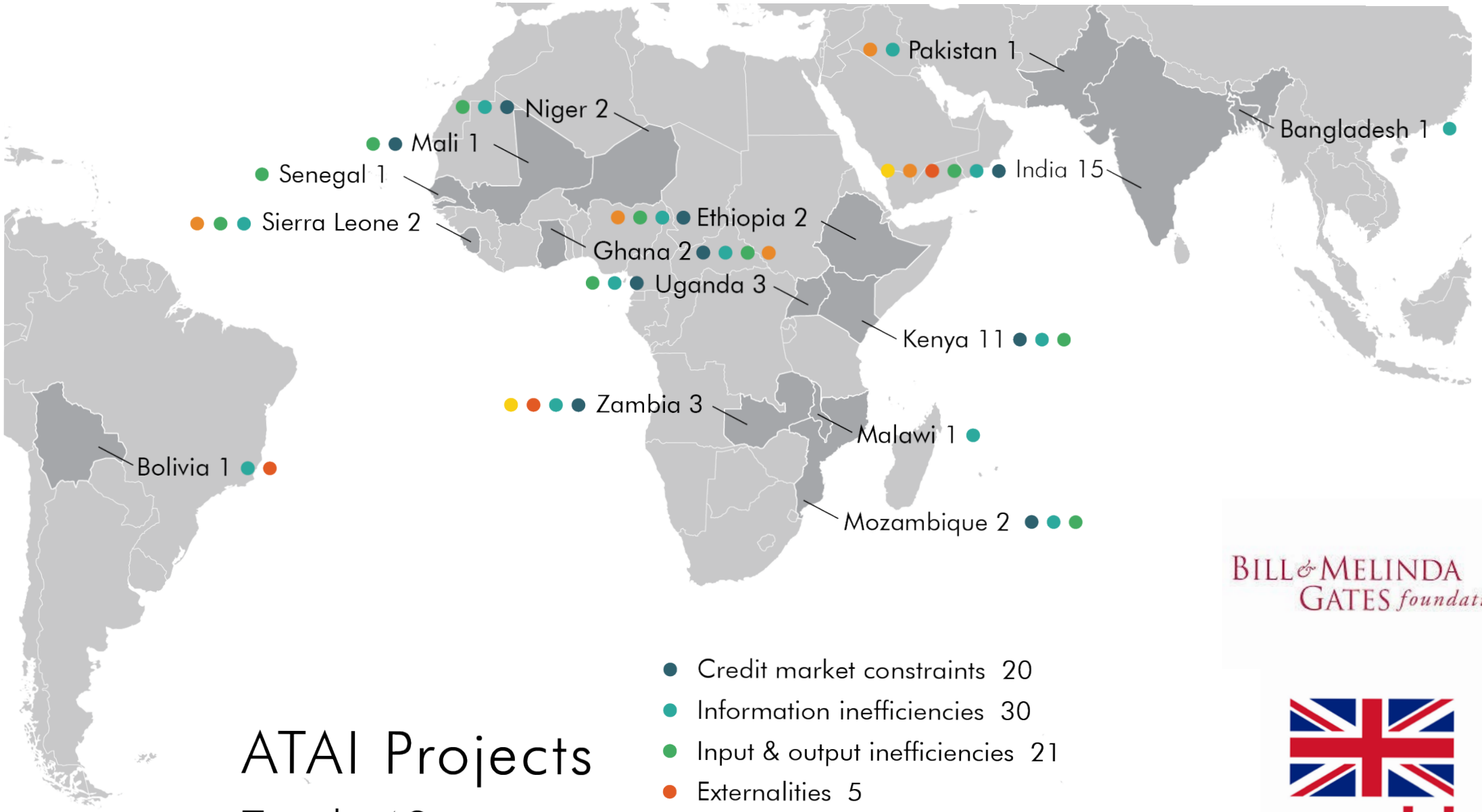
Yet absolutely essential to make policy and program design decisions

Methods: RCTs establish causality (rigorous, challenging)

Impact research at ATAI

Theory of Change: explaining the adoption puzzle





ATAI Projects

Total: 48

- Credit market constraints 20
- Information inefficiencies 30
- Input & output inefficiencies 21
- Externalities 5
- Risk market inefficiencies 11
- Labor inefficiencies 5
- Land inefficiencies 0

BILL & MELINDA GATES foundation

UKaid
from the British people

Mobilizing the research community

- Research network of economists working in close collaboration with agricultural experts (CG centers, research institutions, implementers)

- Increased interest from researchers
  - 108 PIs across all awarded projects
  - More than half (58) had not conducted research in agriculture before first ATAI award
  - 17 PIs were graduate students at first award
  - 9 PIs are researchers or academics based in project country

- Over 120 proposals submitted over eight RFPs

Developing research and policy partners

ATAI PIs have worked with over 50 partners on evaluations

Since the start of ATAI...

Category	Total
Farmers surveyed	111,351
Female farmers surveyed	47,845
ATAI Awards	61
Unique ATAI projects	48
Countries with ATAI projects	15
Working papers	13
Published papers	7

ATAI board

Officers

Craig McIntosh
UC San Diego

Tavneet Suri
MIT Sloan

Jeremy Magruder
UC Berkeley

Members (permanent or rotating)

- Shawn Cole (Harvard Business)
- Alain de Janvry (UC Berkeley)
- Jon Robinson (UC San Diego)
- Organizational representatives from:
  - Bill & Melinda Gates Foundation
  - DFID

ATAI 1.0 Evidence & Policy Insights

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

Profits vs Yields

- Governments and NGOs maximize yield, rather than farmer profit
- Farmer decisions are based on profit, not yield

Duflo et al. 2008, Hanna et al. 2013

What inefficiencies might constrain adoption?

Priority topic	What have we learned?
Credit markets	
Risk markets	
Information and extension	
Inputs / outputs markets	

What have we learned so far?

Priority topic	What have we learned?
Credit markets	• Standard microfinance-type capital is often unavailable to or inappropriate for farmers. • Adapting the lending model to the needs of smallholders can improve take-up. • Lack of credit is unlikely *the* primary constraint to agricultural investment
Risk markets	• Standalone weather index insurance can increase risk-taking in production decisions, but has limited commercial viability at market prices. • New risk-mitigating crop varieties provide a promising alternative to insurance that can reduce aggregate risk in the agricultural system and produce higher yields
Information and extension	• Agricultural extension is the most common model to transmit information to farmers, but the use of traditional extension services is low. • However, extension may be effective when providing information on a profitable practice that overcomes a behavioral bias like procrastination. • Information diffusion can be improved by adapting pedagogical models to be more responsive farmers needs and by incentivizing extension workers.
Inputs / outputs markets	• Farmers in Sub-Saharan Africa and South Asia often operate in shallow markets where access to inputs and venues to sell outputs restrain their abilities to make potentially profitable investments in their farms. • Improving access to deeper markets may open opportunities to improve profits including increasing the adoption of improved inputs and post-harvest storage. • Simply providing price information to farmers is unlikely to have significant effects on farmer incomes or price levels.

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Policy insights: credit and savings

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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 and savings: evidence-based insights

- Evidence from 18 studies
- Access to capital affects agricultural activity, yet take up of credit products 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

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 and savings: evidence-based insights

Some strategies 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 inputs
  - Labels or commitment devices to allocate resources for certain times

Credit and savings: emphasis for future research

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

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

- Evidence from 13 studies
- Standalone weather index insurance can increase risk-taking in production, but has limited commercial viability at market prices
  - Low demand at market prices (16%; 50% subsidy increases demand to 38%)
  - Linking credit with insurance: mixed results, low demand
  - Demand increases when farmers observe payouts
  - Improving financial literacy/ understanding increases take-up, but cost of training much higher than premiums
  - Impacts: increases risk-taking in production decisions
- New risk-mitigating crop varieties a promising alternative

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 benefits of insurance & decrease aggregate exposure 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
- 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 align index triggers & experienced losses at farm

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Policy insights: information

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Information: context

- 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 the technology exists
  - Something about the benefits and costs of the technology
  - How to use the technology effectively

Information: evidence-based insights

- Evidence from 13 studies
- Use of traditional extension services is low
  - Often promote a technology that is unprofitable
  - Effective when providing information on a profitable practice that overcomes a behavioral bias like procrastination
- Training can be effective in increasing adoption in the context of new or novel technologies such as risk reducing seeds

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: evidence-based insights

- 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

Information: emphasis for future research

- Information provision for 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
  - Target training efforts on 'central individuals'
- Tailor information more precisely to individual farmers' contexts
  - Precision agriculture: disaggregate blanket recommendations, tailor extension advice based on local soil quality, crop requirements

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Policy insights: input and output markets

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Input/output markets: context

- Farmers often operate in shallow markets where investing in inputs and technologies that increase yields may not increase farmer profit
- Increasing farmers' access to deeper output markets may create incentives to adopt technology and improve yields and profits
- If information constraints prevent farmers from knowing prevailing prices at different markets, accessing price information may help some players in the sector

Input/output markets: evidence-based insights

- Evidence from 5 studies

- Simply providing price information to farmers does not 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, helps market prices converge
  - Pass through?

Aker 2010, Fafchamps & Minten 2012, Goyal 2010, Jensen 2007, Mitra et al. 2015, Ali 2011, Ashraf et al. 2009, Brambilla & Porto 2011, Casaburi et al. 2013, Casaburi & Reed 2014, Casaburi et al., forthcoming, Fafchamps et al. 2008, Hoffmann et al. 2013, Raballand et al. 2011

Input/output markets: emphasis for future research

- Is poor infrastructure a primary barrier to technology adoption?
- Do enforceable contracts between farmers and purchasers improve supply chains with benefits to farmers and/or traders?
  - Contract farming?
- Does crop quality information get passed along the value chain and are higher-quality outputs rewarded?
  - Do buyers and sellers trust each other?
  - Are farmers most strongly rewarded by quantity rather than quality?
- Still more to learn on if/how market shallowness may be a significant constraint to positive investment

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Use of evidence

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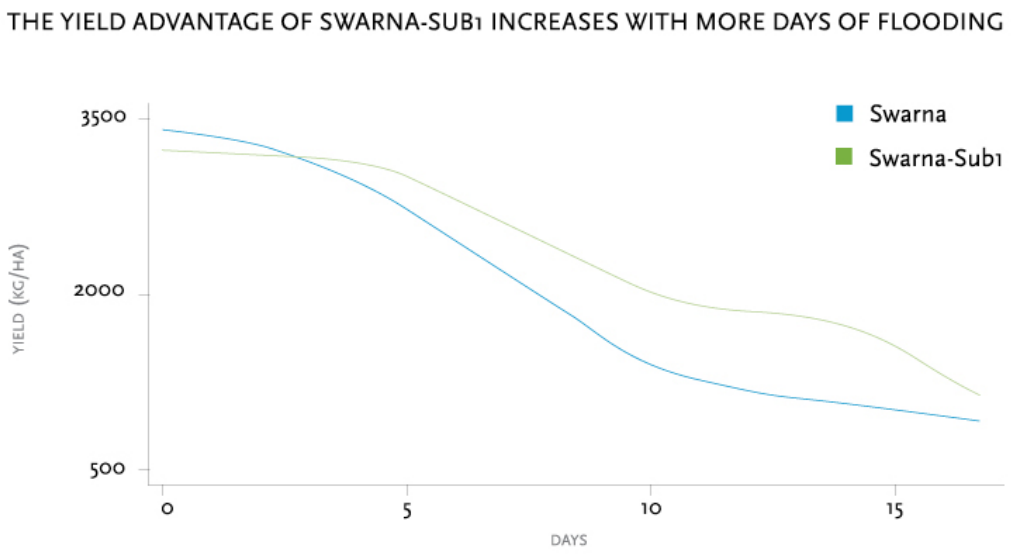
ATAI research supported increased investment in Swarna-sub1

- The adoption of flood tolerant rice:
  - Reduced risk for smallholder farmers
  - Encouraged additional smallholder investment
  - Increased yields in both flood and non-flood years

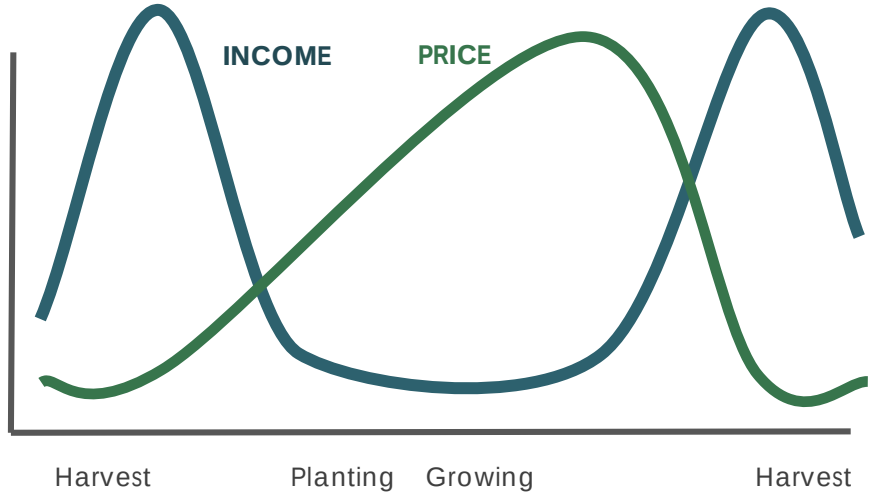
- Odisha State Seeds Corporation (ORISEED) increased its production from 300 MT (2012) to more than 6,000 MT (2015)
  - IRRI cites ATAI research as a key contribution to this scaling



De Janvry et al.

ATAI research informed One Acre Fund product offerings

- Offers of maize storage loans at harvest:
  - Increased storage in the months immediately following harvest
  - Increased borrower's net revenues
  - Led to price increases of ~3% in areas with more loan offers, suggesting potential for general equilibrium effects



- One Acre Fund scaled this product to 6 districts in Kenya in 2017, covering 70,000 farmers
  - Ongoing assessment of additional scaling

Burke, Miguel, and Falcao Berquist

ATAI researchers and staff disseminate results around the globe

Events organized by ATAI over the last year include:

- Two conferences to convene stakeholders in east and west Africa
- Day-long event at East Africa Evidence Summit
- Policy partnership scoping with MAFAP
- Four-part presentation / webinar series with TOPS and with OCP

CEGA and J-PAL staff support outreach and partnership development

- Summarize and synthesize evidence for policymakers, implementers, donors


BRIEFCASE

RESILIENT RICE

Flood-tolerant rice reduced risk for smallholder farmers in Odisha, India and encouraged additional investment in their farms, resulting in substantially increased yields in both flood and non-flood years.

Featuring an evaluation by Manzoor Dar, Alain de Janvry, Kyle Emerick, and Elisabeth Sadoulet

- Share and map ATAI evidence to existing policies and priorities

- Assess feasibility for conducting impact research of programs and facilitate matches between implementers and research network

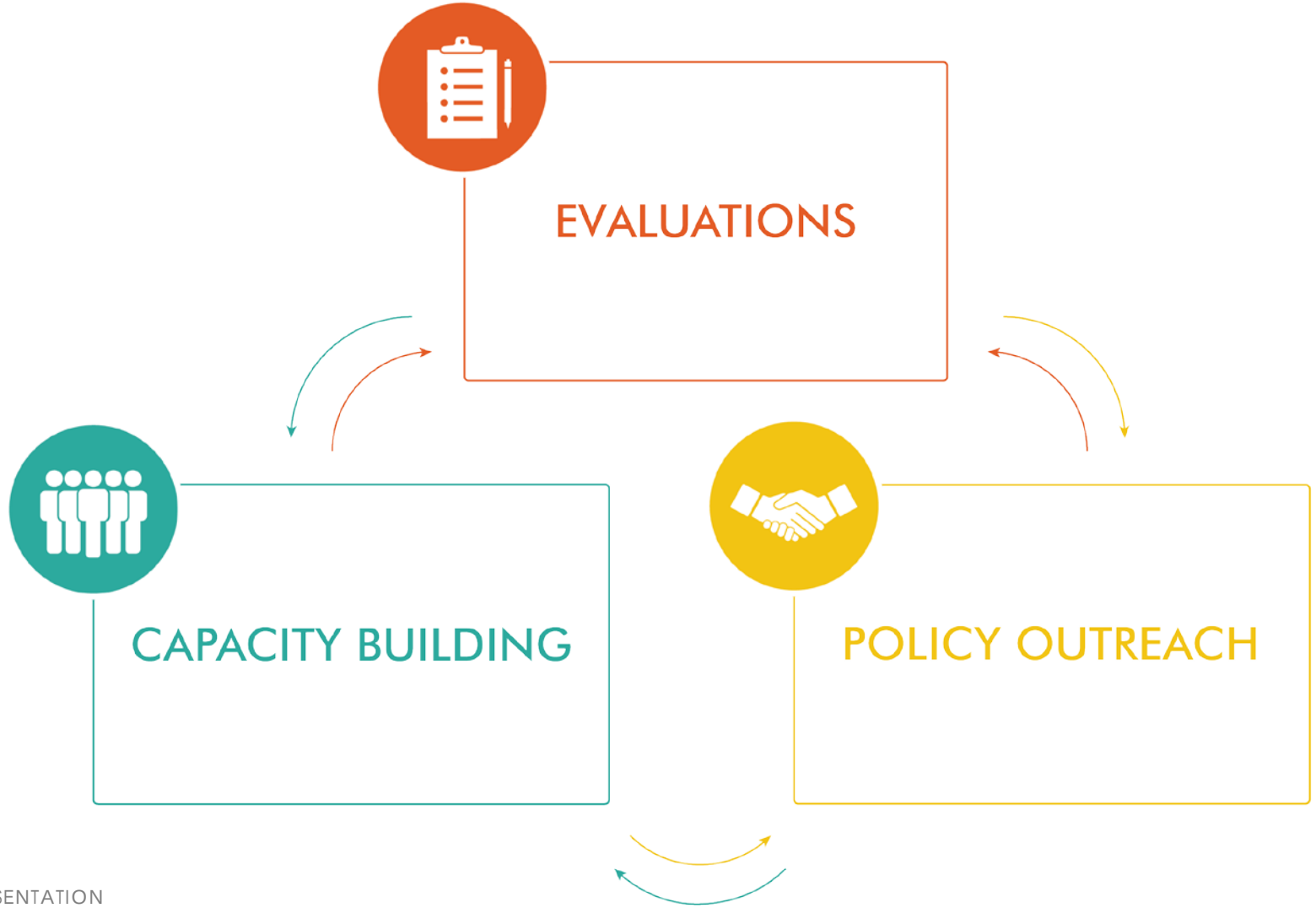

BULLETIN

POLICY BULLETIN [FEBRUARY 2016]

MAKE IT RAIN

Weather index insurance protects farmers against losses from extreme weather and facilitates investment in their farms, but randomized evaluations in South Asia and sub-Saharan Africa have shown low demand for these products at market prices, suggesting the need for alternative approaches.

J-PAL's mission is to reduce poverty by ensuring that policy is informed by scientific evidence.



J-PAL's regional offices actively engage local policymakers and implementers

Who is CEGA?

Our team is growing




77 all academics, from multiple disciplines long the West Coast

100+ Ph.D. students across the country and world

26 visiting researchers from low-income countries

25 staff and postdocs to run the center's operation



CEGA

EASST
EAST AFRICA SOCIAL SCIENCE TRANSLATION

Geo4Dev

UNIVERSITY OF CALIFORNIA

Looking forward: mapping ATAI research to agricultural transformation

Mapping ATAI research to agricultural transformation

Agricultural Production

	Factors of Production	Inputs of Production	Post-Harvest / Marketing
Initial ATAI Constraints	Land		
	Labor		
		Input Markets	Output Markets
		Smallholder Credit	
		Agricultural Risk (mitigation)	
		Agricultural Information	
Technologies		Seeds Fertilizer	Storage Roads
Sample Studies by ATAI PIs		de Janvry et al. Swarna Carter et al. Subsidies Savings	Aker Dillon Storage Casaburi et al. Roads

Mapping ATAI research to agricultural transformation

Agricultural Transformation

	Contracts	Diversification	Market Linkages
Initial ATAI Constraints	Land		
	Labor		Labor
	Output Markets		
	Small Enterprise Credit		
	Agricultural Risk (mitigation)		
	Contractual Information	Labor Market Information	
Technologies	Legal Enforcement Futures / Forward Markets	Financial Services Mechanization	Integrated Supply Chains Migration
Sample Studies by ATAI PIs	de Janvry et al. Senegal Casaburi et al. Contracts	Cohen et al. QPM Suri et al. Mpesa	Bergquist et al. BML Magruder et al. Labor Markets

Mapping ATAI research to agricultural transformation

	Agricultural Production			Agricultural Transformation		
	Factors of Production	**Inputs of Production**	**Post-Harvest / Marketing**	**Contracts**	**Diversification**	**Market Linkages**
Initial ATAI Constraints	Land			Land		
	Labor			Labor		Labor
		Input Markets	Output Markets	Output Markets		
		Smallholder Credit		Small Enterprise Credit		
		Agricultural Risk (mitigation)		Agricultural Risk (mitigation)		
		Agricultural Information		Contractual Information	Labor Market Information	
Technologies		Seeds Fertilizer	Storage Roads	Legal Enforcement Futures / Forward Markets	Financial Services Mechanization	Integrated Supply Chains Migration
Sample Studies by ATAI PIs		de Janvry et al. Swarna Carter et al. Subsidies Savings	Aker Dillon Storage Casaburi et al. Roads	de Janvry et al. Senegal Casaburi et al. Contracts	Cohen et al. QPM Suri et al. Mpesa	Bergquist et al. BML Magruder et al. Labor Markets

What comes next?

Generate new knowledge around key questions on agricultural transformation

- Increase focus on institutions and markets and incentivize research on these systems
- Incorporate targeted cross-cutting themes (including gender, nutrition, spatial heterogeneity, and environmental impacts)
- Leverage existing project data to extend learnings

What comes next?

Promote the uptake and application of ATAI evidence

- Deepen continuous engagement with implementers and funders to better target research questions and opportunities

- Promote research and outreach that ensures ATAI learnings are international public goods
  - Generate broadly relevant knowledge on agricultural transformation
  - Open, public, and accessible resources, including data and results

Thank you

For questions or requests email:
atai@povertyactionlab.org