Evidence from ATAI

Kyle Murphy – Policy Manager, J-PAL Global

Becca Toole – Senior Policy Associate, J-PAL Global

I. Into to J-PAL / CEGA / ATAI

II. Evaluations in Agriculture

III. Research priorities going forward

IV. How we partner

Intro to ATAI, CEGA, and J-PAL

atai AGRICULTURAL TECHNOLOGY ADOPTION INITIATIVE

Q: What helps and what hinders smallholder farmers' **adoption** of technologies and access to markets?

Which approaches **impact** farmer profits and welfare?

A: ...well, let's tackle this scientifically

➔ Review available evidence: identify key research needs since 2009

➔ Mobilize research networks:

- "clearinghouse" rather than consultant model
- fund competitively-selected, high-quality randomized evaluations

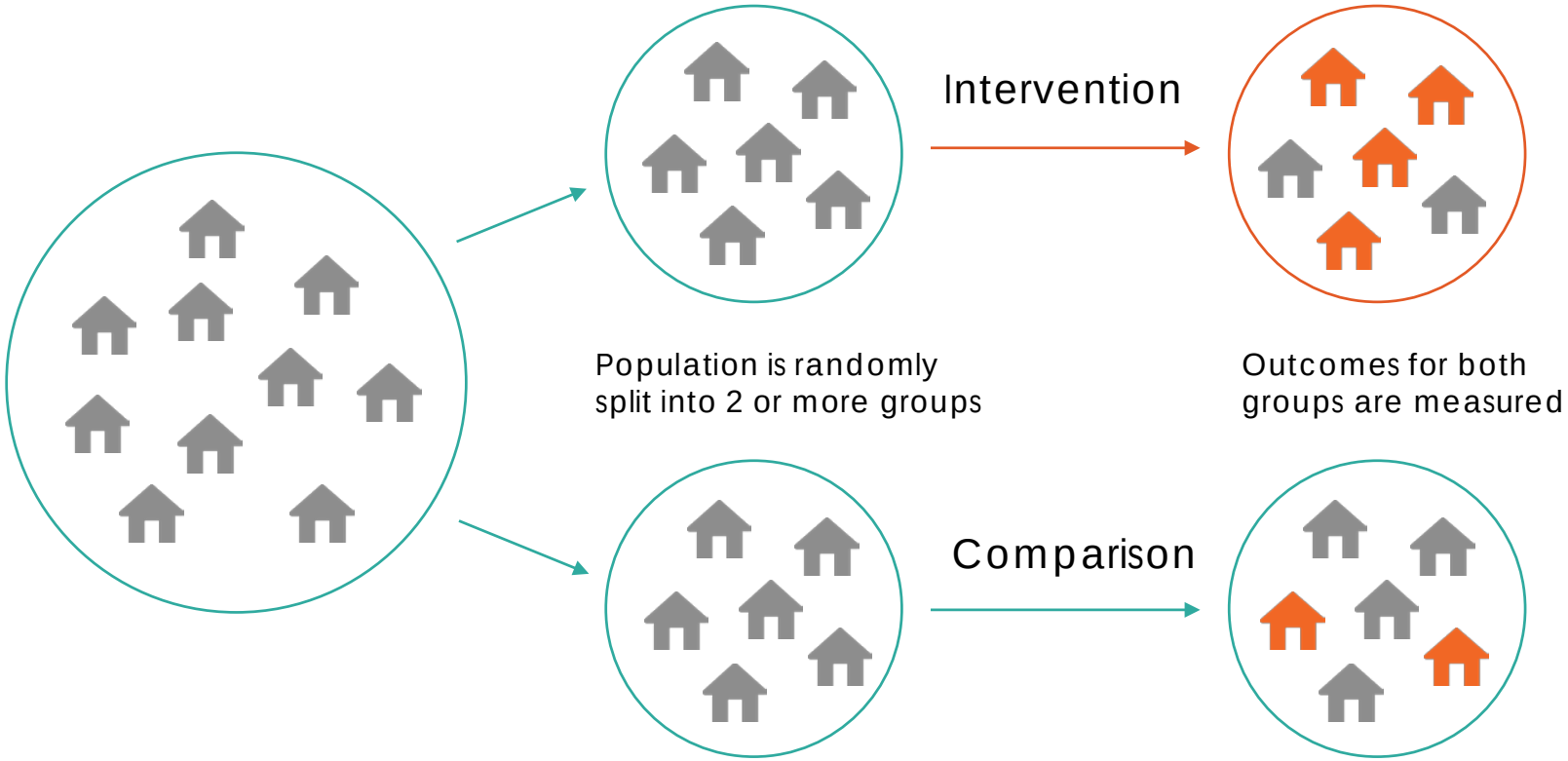
➔ Share findings: inform relevant decision-making

Inefficiencies constraining technology adoption

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

Randomized evaluations provide a highly rigorous estimate of program impact

Before the program starts, eligible individuals are randomly assigned to two or more groups so that they are statistically identical before the program.



Two groups continue to be identical, except for treatment

Any differences in outcomes between the groups can be attributed to the program

Randomized evaluations provide a highly rigorous estimate of program impact

- Important to identify "causality"
  - Lessons for program and policy design
  - Supports results-based management of programs

- RCTs have become a widely used methodology
  - Not only an academic approach
  - Strong demand by development partners (One Acre Fund, CGIAR, Technoserve, etc.)

- RCTs in economics help understand in particular the role of behavior and institutions (agricultural systems) in program/policy outcomes

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Co-managed by:

CEGA Center for Effective Global Action at UC Berkeley

J-PAL at MIT
ABDUL LATIF JAMEEL POVERTY ACTION LAB

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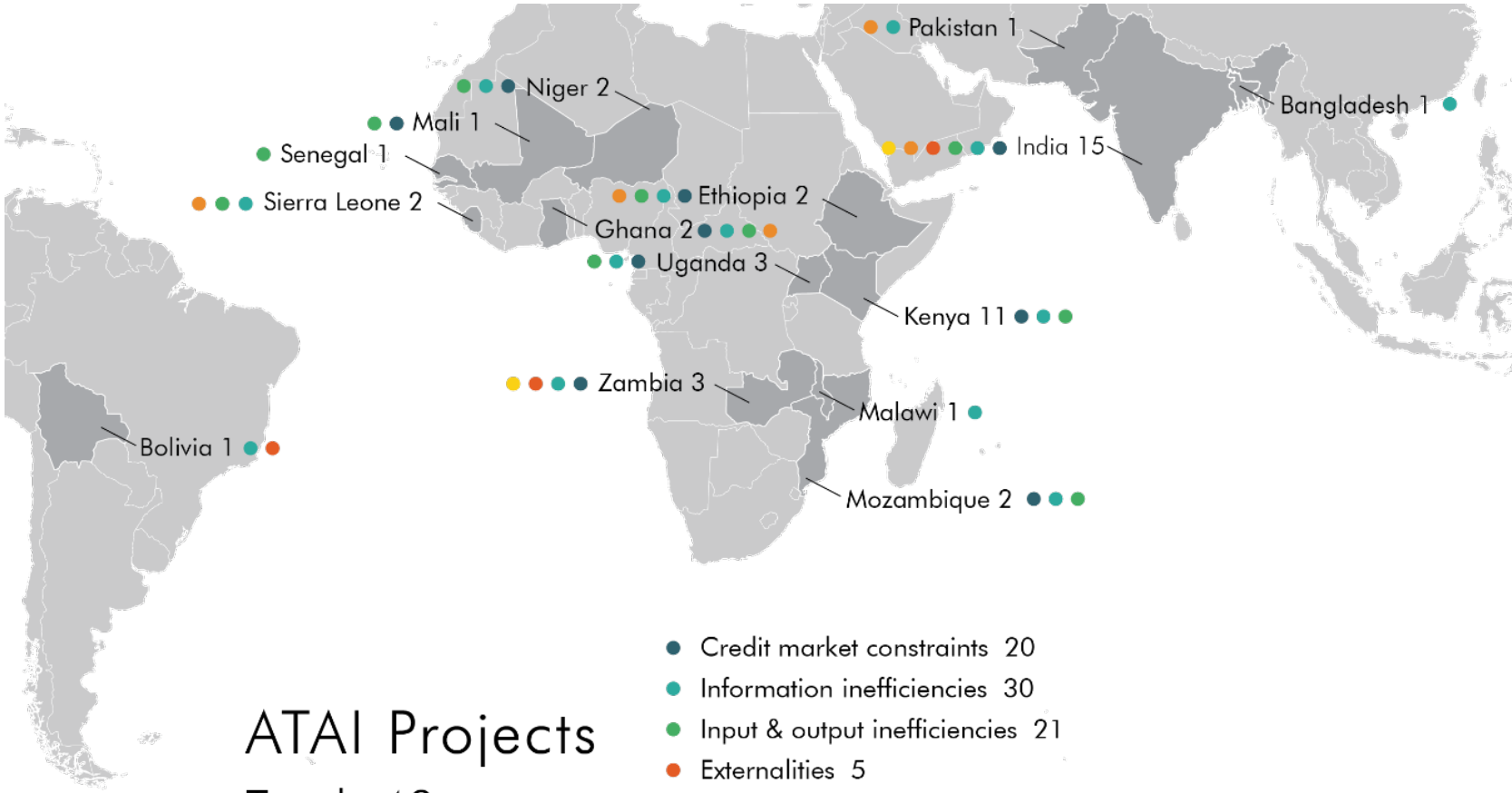
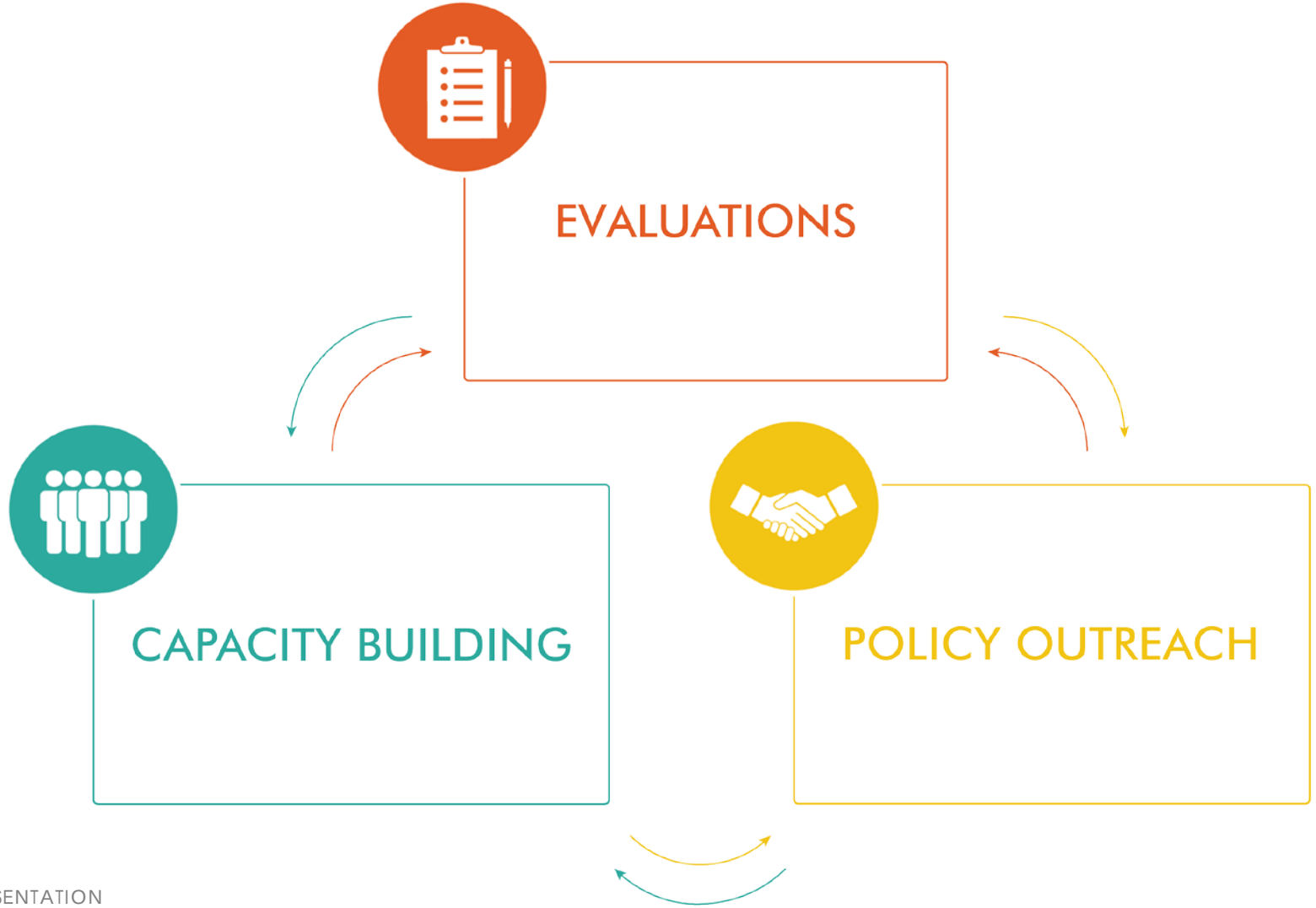


ATAI Projects

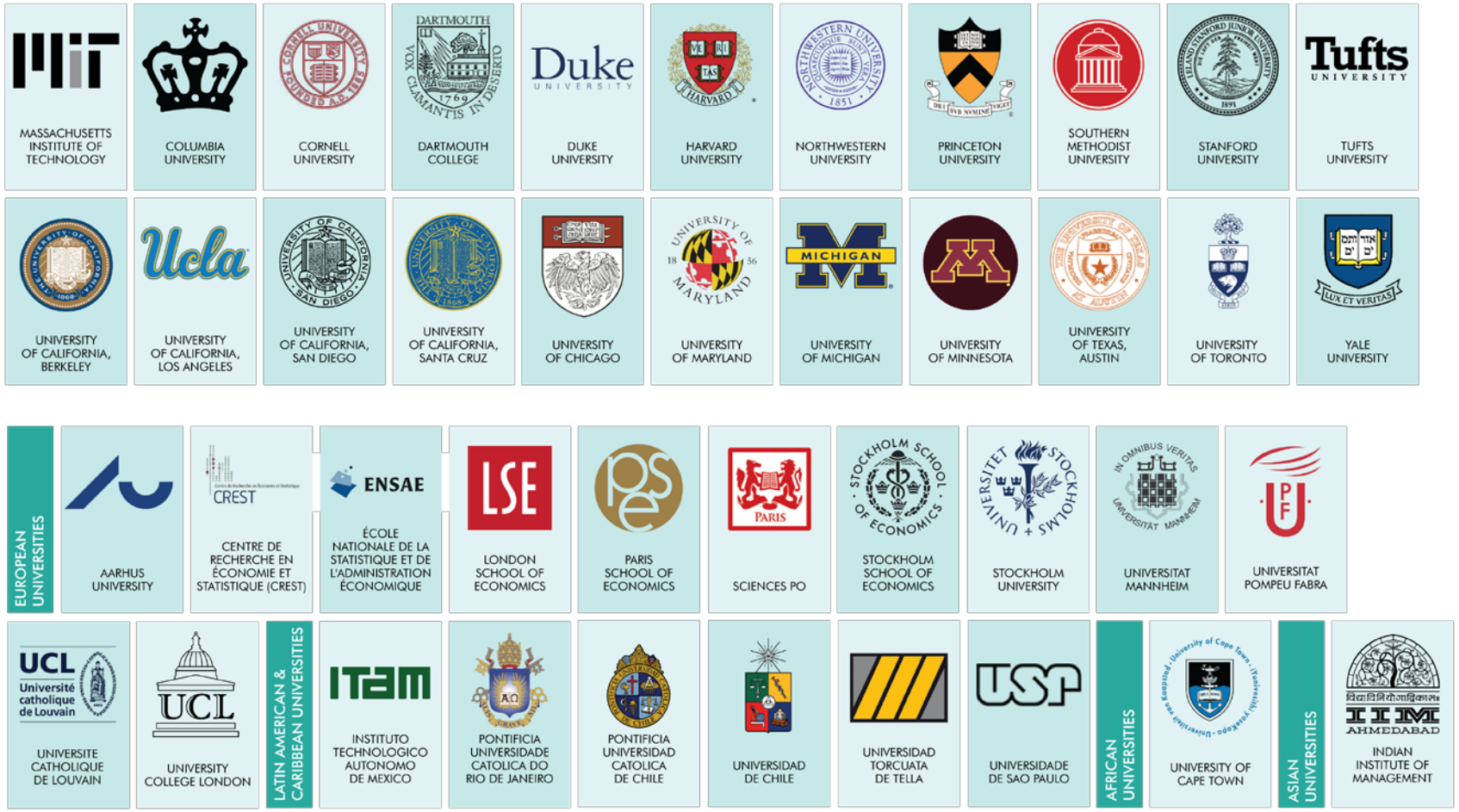
Total: 48

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

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



J-PAL's network of over 160 professors use randomized evaluations to inform policy



We work across 10 sectors

Agriculture

Crime, Violence, and Conflict

Education

Enivronment and Energy

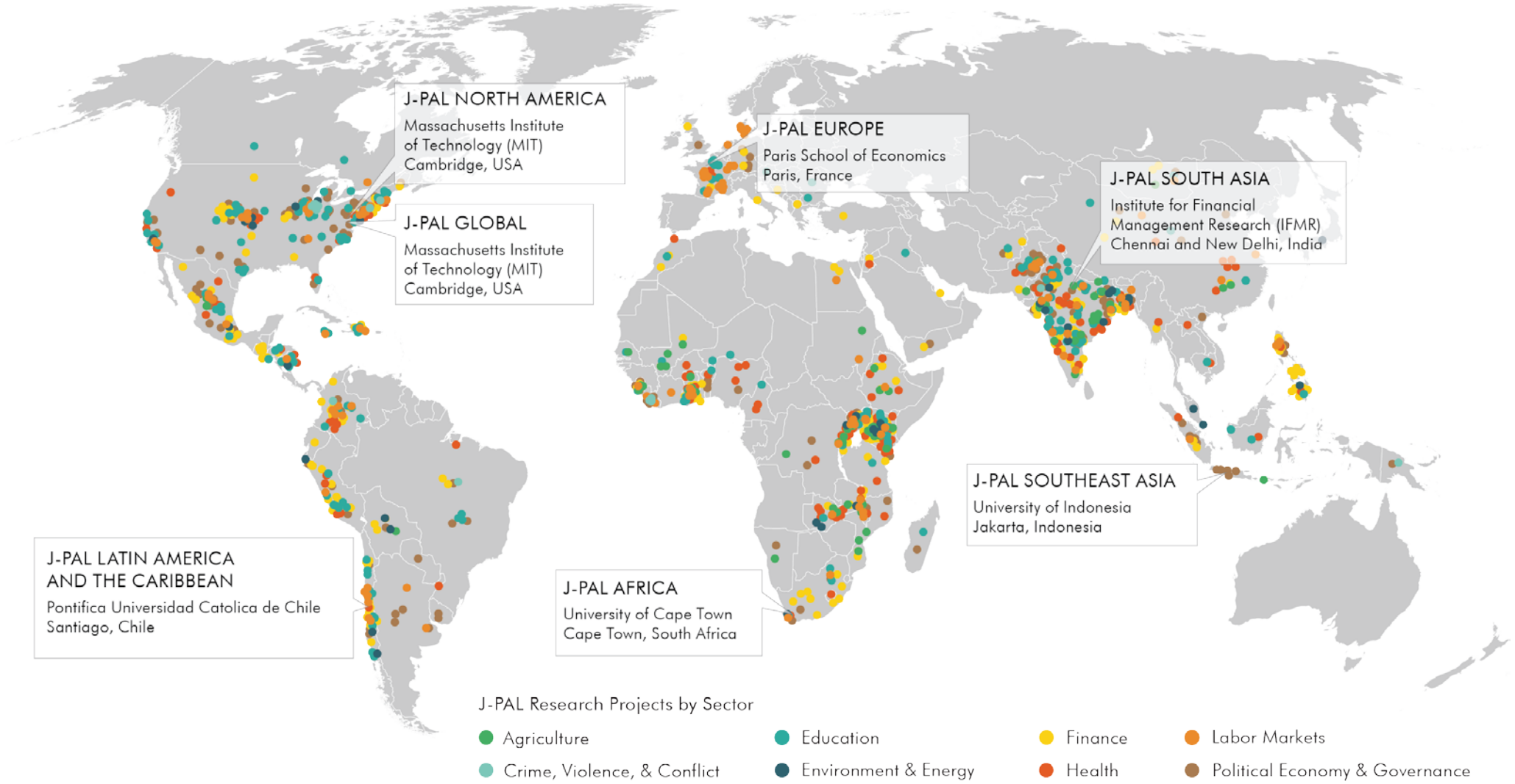
Finance

Health

Labor Markets

Political Economy and Governance

We have more than 900 ongoing and completed projects across 8 sectors in 80 countries



Evaluations in Agriculture

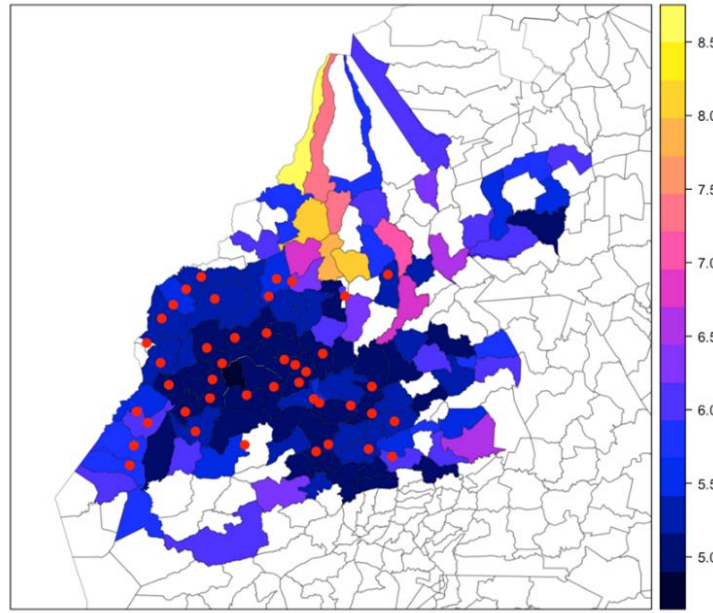
Mobile IVR extension in India

- Hotline to ask agricultural experts questions, listen to other farmers' questions
- Weekly information and tips via automated voice message
- **High take up and use of mobile platform**
- **Farmers changed their sowing and input use decisions**
  - Switched to more effective pesticides
  - Increased adoption of cumin
  - Suggestive evidence that yields and profits increased for cotton and cumin
- **Cost-effective but low willingness to pay**
  - Estimated return of $10 per $1 spent

Cole and Fernando 2012, Cole and Fernando 2016

Precision Agriculture for Development (PAD)

- Founded by two ATAI affiliates; awarded funding for three projects
- Currently working in Kenya, Ethiopia, India, Pakistan, Ecuador
  - Scoping Uganda and Rwanda
  - Works with agriculture ministries, social enterprises, & NGOs
  - Refine and improve existing programs; develop new systems
- ICT extension, information, & alerts
- Soil health cards



Integrating Value Chains to Improve Food Safety in Kenya

- Severe health consequences of Aflatoxin
- Effective preventative technologies rarely adopted by smallholders
  - Contamination risk to own food supply
  - Also prevents smallholders' access to potentially higher-value output markets
- Rigorously evaluating adoption of preventive biocontrol Aflasafe KE01 and mobile dryers, and ex-post testing
  - When access to output markets facilitated: food safety conditional purchase commitment from a formal sector buyer
  - Whether introduction of aflatoxin testing reduces aflatoxin exposure among the poor

Hoffmann et al., forthcoming

Expected Market Reforms and Crop Quality in Senegal

- Onions would be sold based on weight (not volume), with quality certification
- Information campaign about upcoming reform and training on quality-enhancing cultivation
  - Improved onion quality: more quality-enhancing fertilizers, more onion sorting
  - Substantial income gains (10.7 percent increase)
- Despite gains, market reform not sustained given traders' resistance

Bernard et al. 2017

Building Market Linkages in Uganda

- Isolated, shallow markets
- Can new contract farming services and an ICT-enabled trader alert system improve market depth in favor of smallholders?
  - Overcoming transaction mismatches through market information and “e-bulking”
  - Experimental cross-cuts with financial services, price information
- Impacts on input use, yields, market linkages, sales volumes, price dispersion, profits?
  - Impacts of contractual risk and credit in determining the probability of successful contracting?

Bergquist et al., forthcoming

Future research priorities

Use simple and accessible channels, provide timely guidance, and focus on important aspects that are difficult to observe.

Most traditional extension programs have struggled to influence farmers' decisions.

- Adapting the pedagogical model
- Mechanisms to tailor information
- Targeting information and leveraging networks

Tailoring credit products to agricultural contexts can improve take-up and impact

Increasing access to traditional microcredit has had limited impacts on smallholder farmers' profitability.

- Lending products using flexible collateral (leasing)
- Credit, savings, storage, etc. products based on timing in the agricultural cycle
- Institutions that can bolster information about borrowers (credit bureaus, fingerprinting)

When protected from risk, farmers invest more.

One strategy to mitigate risk is weather index insurance, which protects farmers against losses from extreme weather but demand for this product is often low.

- Risk-protective seeds and technology
- Meso-level insurance
- Use of free insurance as a form of social protection
- Strategies to reduce basis risk in index insurance products

Profitability is integral to adoption.

Increasing research in market linkages, value chains.

- Do enforceable contracts between farmers and purchasers improve supply chains with benefits to farmers? To traders? Both?
- Does crop quality information get passed along the value chain? Are higher-quality outputs rewarded?
- Whether / how market shallowness may be a significant constraint to positive investment?

How do we partner?

Developing research and policy partners

ATAI researchers have worked with over 50 partners on evaluations

How can we work together?

- Where opportunities to randomize, team up with our research networks
  - ATAI (and CEGA / J-PAL) can help "match-make"
- Bi-annual research funding competitions for affiliated RCTs
- Opportune policy windows to apply existing evidence

What else?

J-PAL: what we are and are not

WHAT WE AREN'T	WHAT WE ARE
A monolithic organization with its own agenda	A **network** of leading researchers from top universities working with local partners on local priorities and issues
External evaluator issuing a forensic performance report	Active **knowledge partner** in helping design, evaluate, and scale-up innovative programs
Interested in a one-off conference or event	Invest in **long-term collaborations** between researchers and policymakers to instutionalize an evidence-informed approach to policymaking

When and when not to do a RCT?

When to do a RCT?

- When you have an important question (cost, coverage)
- When the timing is right
- When the program is representative enough
- When you have resources to do it right
- When you are willing to use the results to learn and act

When NOT to do a RCT?

- When others already answered rigorously
- When the program is premature and still requires considerable "tinkering" to work well
- Better doing nothing than doing it wrong

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CEGA

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Thank you!

www.atai-research.org

atai@povertyactionlab.org

Harvest-time storage loans in Kenya

- Loans allowed farmers to:
  - Buy/keep maize at low prices
  - Store while prices rose
  - Sell later at higher prices
- Temporal arbitrage increased profits, ROI of 28%
  - Profits concentrated in areas where fewer farmers were offered loans
  - Smoothing seasonal price fluctuation: benefits program non-recipients (GE effects)

Burke 2018

ICT and Contract Farming in Kenya

Can simple, well-timed reminders and a service hotline improve adoption of inputs and increase yields?

- High take up of the SMS and hotline interventions
- SMS messages lead to 11.5% yield increases
- Access to hotline decreased the
  - likelihood of not receiving fertilizer
  - likelihood of fertilizer delivery being delayed

CAVEAT: Researchers are replicating the SMS intervention with a larger sample and so far so **no effect on yields**

Casaburi et al. 2014 (forthcoming)

Understanding trader-farmer relationships is key

- These relationships can affect farmers' selling decisions
  - Sierra Leone: palm oil producers were hesitant to break relationships with traders by storing harvests rather than selling at low prices
  - India: potato farmers' ex-post bargaining relationships with traders limited the effectiveness of price information provision
- Not "just" intermediaries, traders can stand-in for financial institutions
  - Sierra Leone: cocoa market traders build committed relationships with producers through credit provision. Cocoa quality premiums aren't passed through to producers via better prices, but credit provision increases
  - Kenya: dairy farmers preferred to sell to co-ops and receive lower, bulked payments (like savings) than sell to traders and receive daily payments

Casaburi et al 2014; Mitra et al 2015; Casaburi et al 2017; Casaburi and Macchiavello 2016

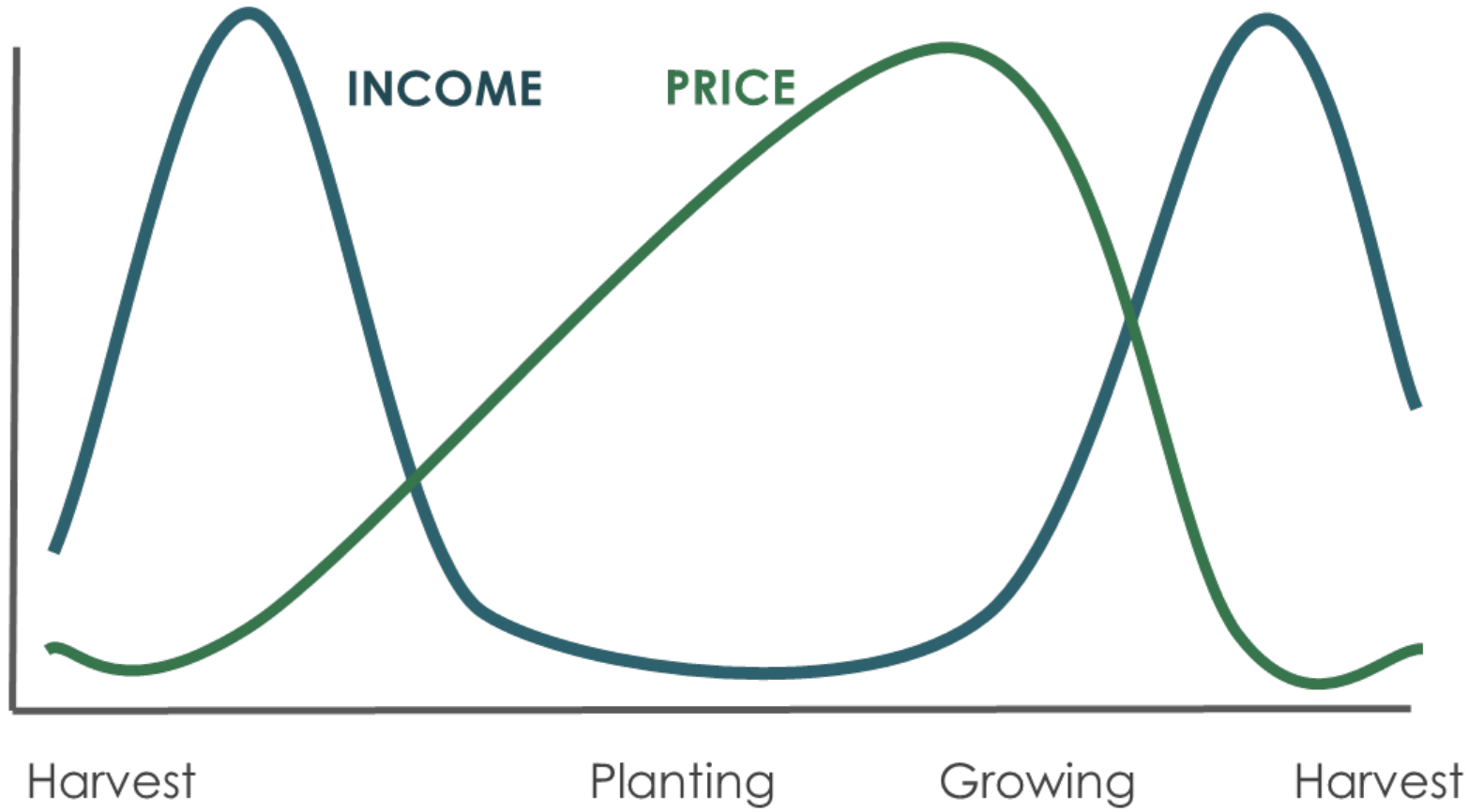
Summary: input/output markets

- Price information:
  - has limited positive effects on farmgate prices, suggesting asymmetric info not a source of market power for traders
  - More evidence that info leads to convergence across markets. Still leads to welfare benefits for farmers.
- Infrastructure investment can decrease transport and input costs
- Recent, preliminary, and ongoing work on:
  - Contracts
  - Market linkages
  - Crop-quality and pricing in supply chains

- Many interventions that improve yields do not subsequently see widespread adoption. Why not?
- Profitability is key.
  - There is no adoption 'puzzle' if, given input prices, output prices, and risk, a rational farmer would choose not to invest.
  - Important to think about scoping conditions: where would a new technology be likely to generate the highest farmer profit?
- RCTs are an excellent way to figure out what does *not* work, as well as what does!

Account for seasonal cycles of production & prices

- Aggregate (not idiosyncratic) risks
- Negative correlation of production and prices
- Seasonal cycles:



Designing products for seasonality

- Delaying repayment of loan until after harvest
- Loans for consumption during “hungry season”
- Storage loans to allow farmers to take advantage of price fluctuations
- Savings products to save from harvest until planting time

Precision Agriculture for Development (PAD)

Based on India and Kenya ATAI RCTs and ongoing follow-ups:

1. Aggregating Data Inputs

General data (weather, potential yields, soil quality, satellite imagery) are combined with farm-level data (crop choice, input use, actual yields, soil samples, farmer demographics)

2. Generating Precision Recommendations

Individualized recommendations are generated for each farmer

3. Communicating with Farmers

Recommendations are sent to farmers via a suite of mobile tools including SMS, voice, and video

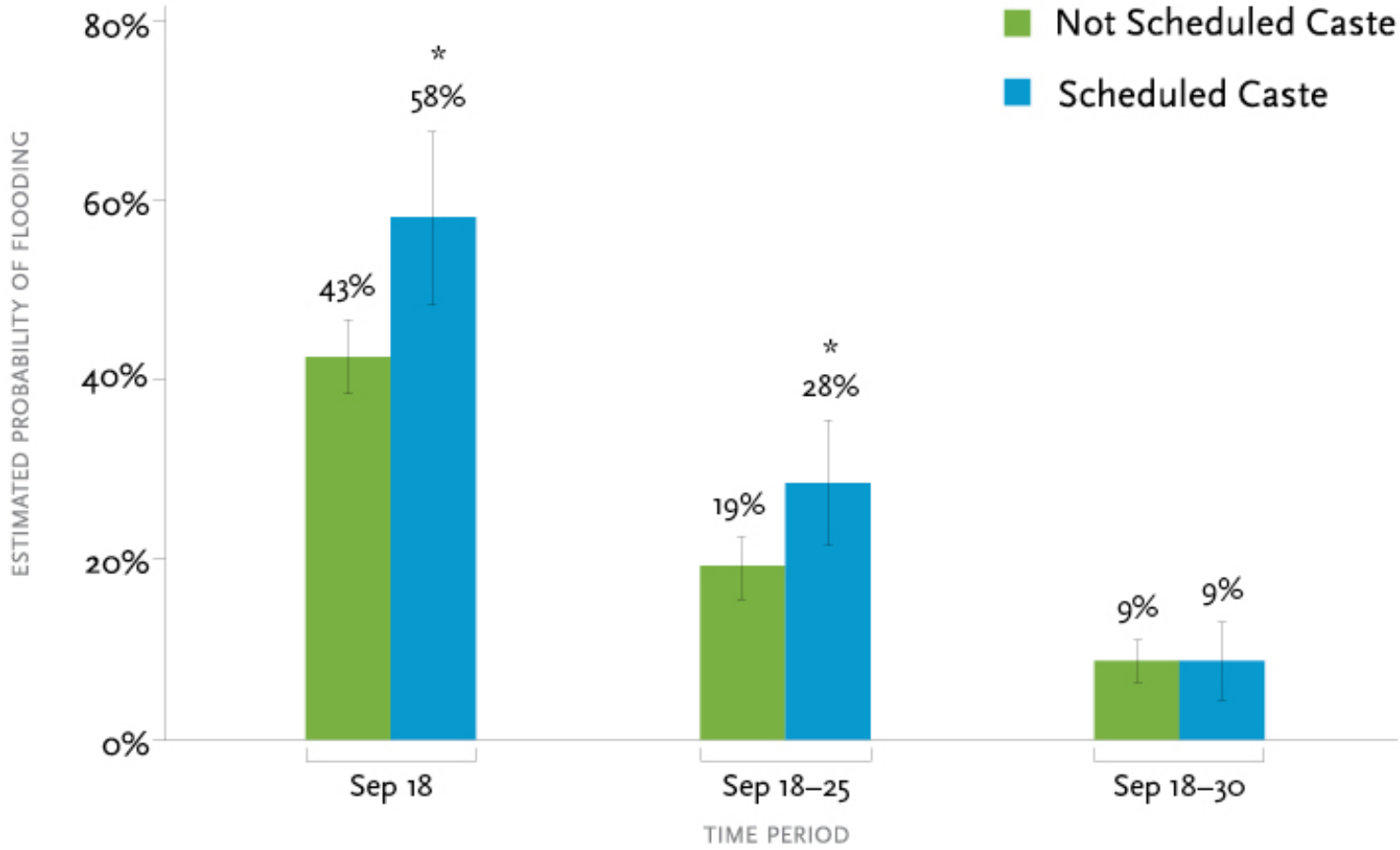
4. Acting and Optimizing

Farmers implement recommendations and input results data to improve future analysis through machine learning techniques

System Characteristics

Hybrid model data generation (experts and farmers)
Constant experimentation and learning
Farmer feedback – two way communication

Scale-up would benefit marginalized populations the most



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

Dar et al 2015

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 real-life conditions in Odisha, India

Dar et al 2015