Evidence in Agriculture: Extension and Information Delivery

Kyle Murphy

Policy Manager, J-PAL

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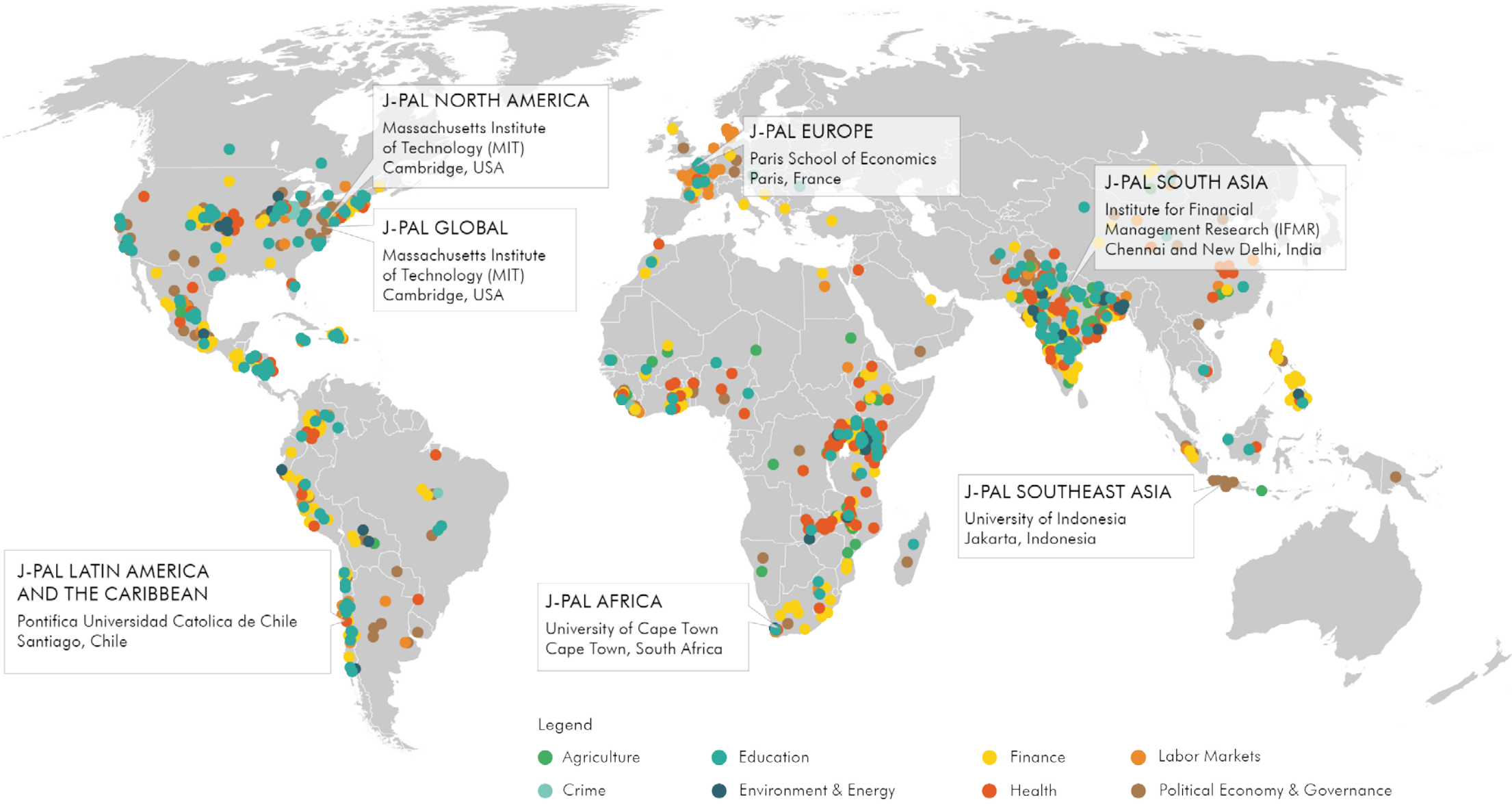
Overview

- Background on J-PAL Agriculture Sector and ATAI
- Our approach
- Evaluations on Extension Service Delivery Models
- Providing Price Information
- Conclusion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Massachusetts Institute of Technology (MIT)
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Cambridge, USA
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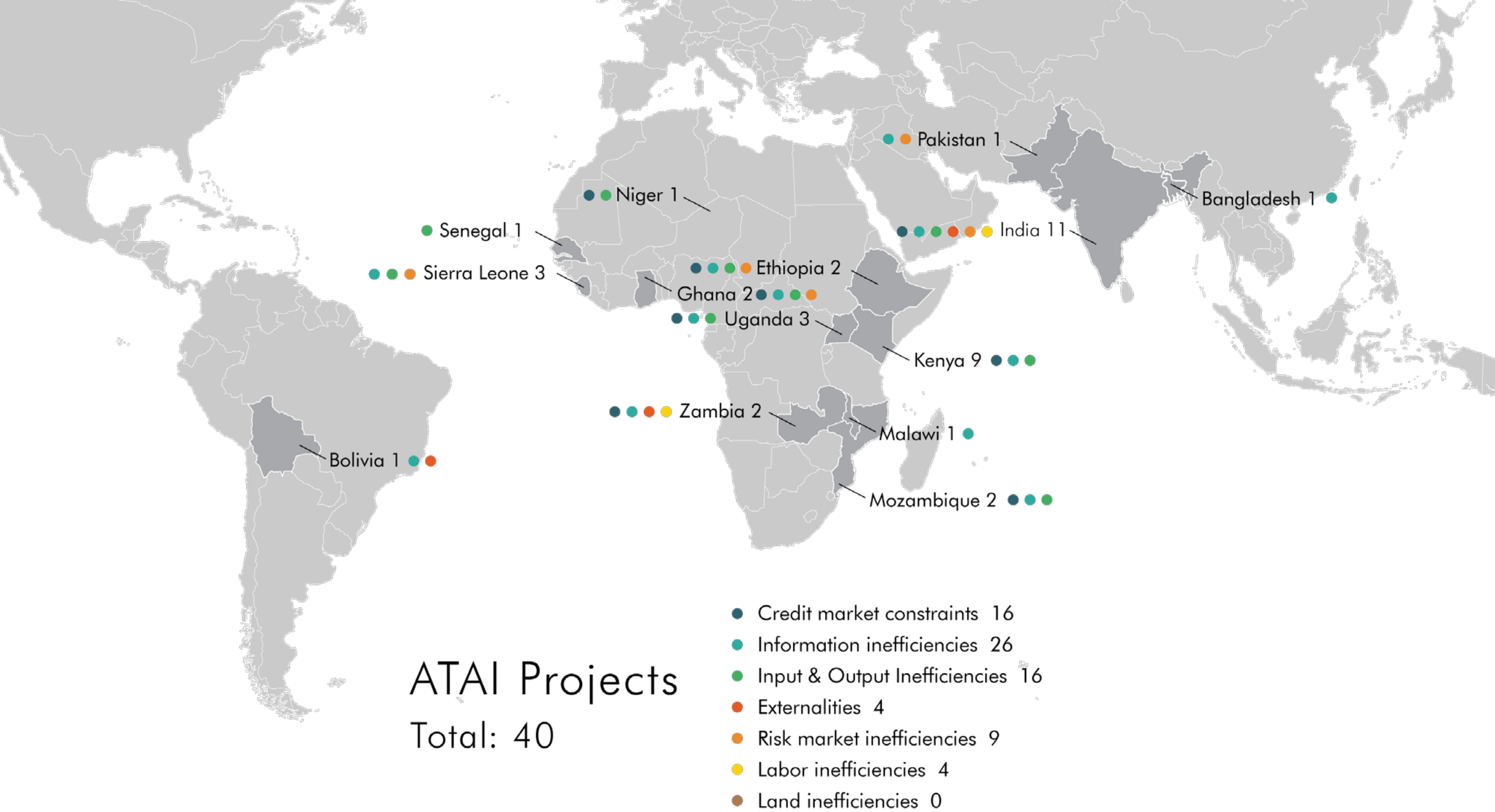
Agriculture project map

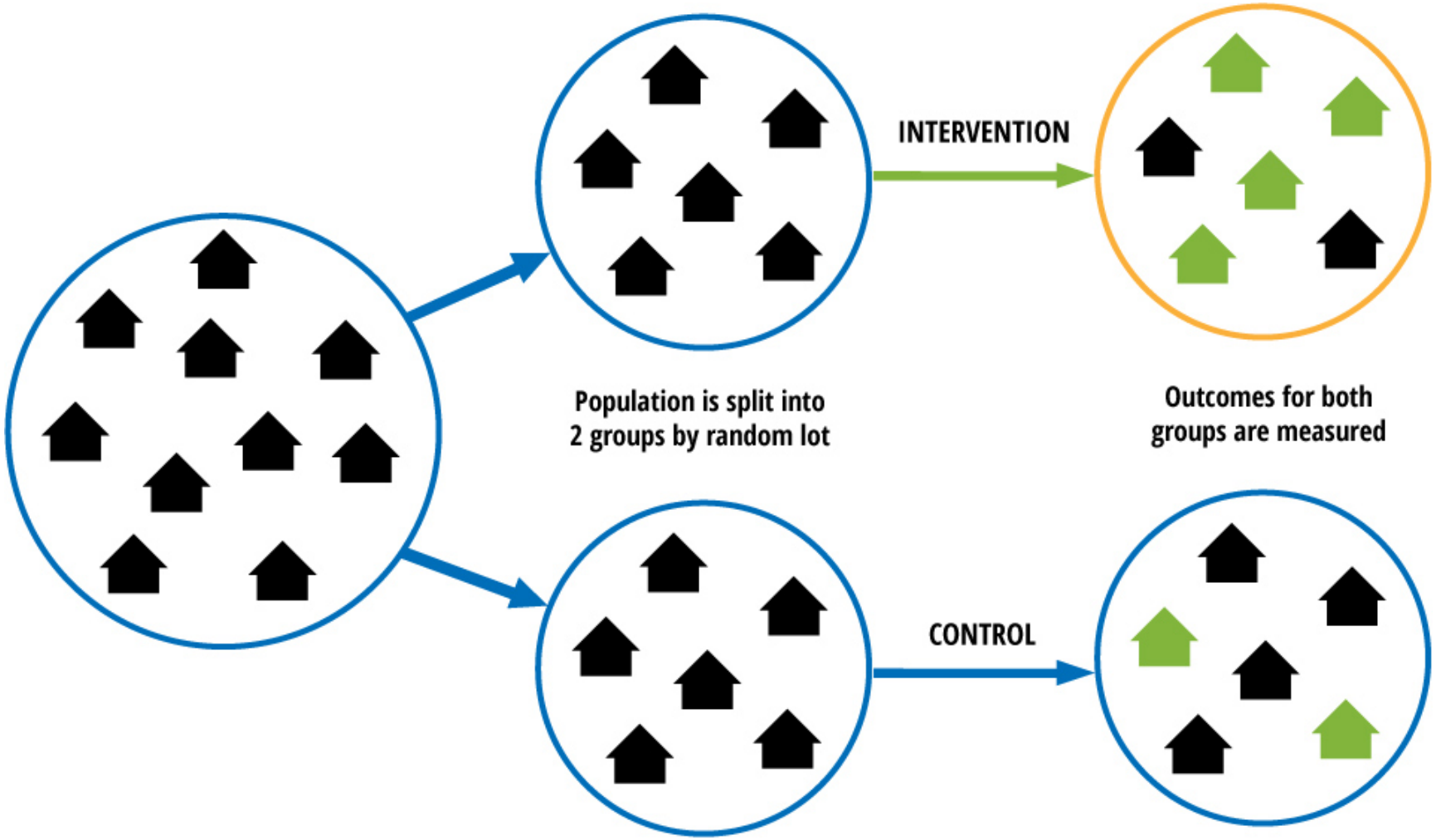


ATAI Projects

Total: 40

- Credit market constraints 16
- Information inefficiencies 26
- Input & Output Inefficiencies 16
- Externalities 4
- Risk market inefficiencies 9
- Labor inefficiencies 4
- Land inefficiencies 0

Randomized evaluations provide the most rigorous estimate of program impact

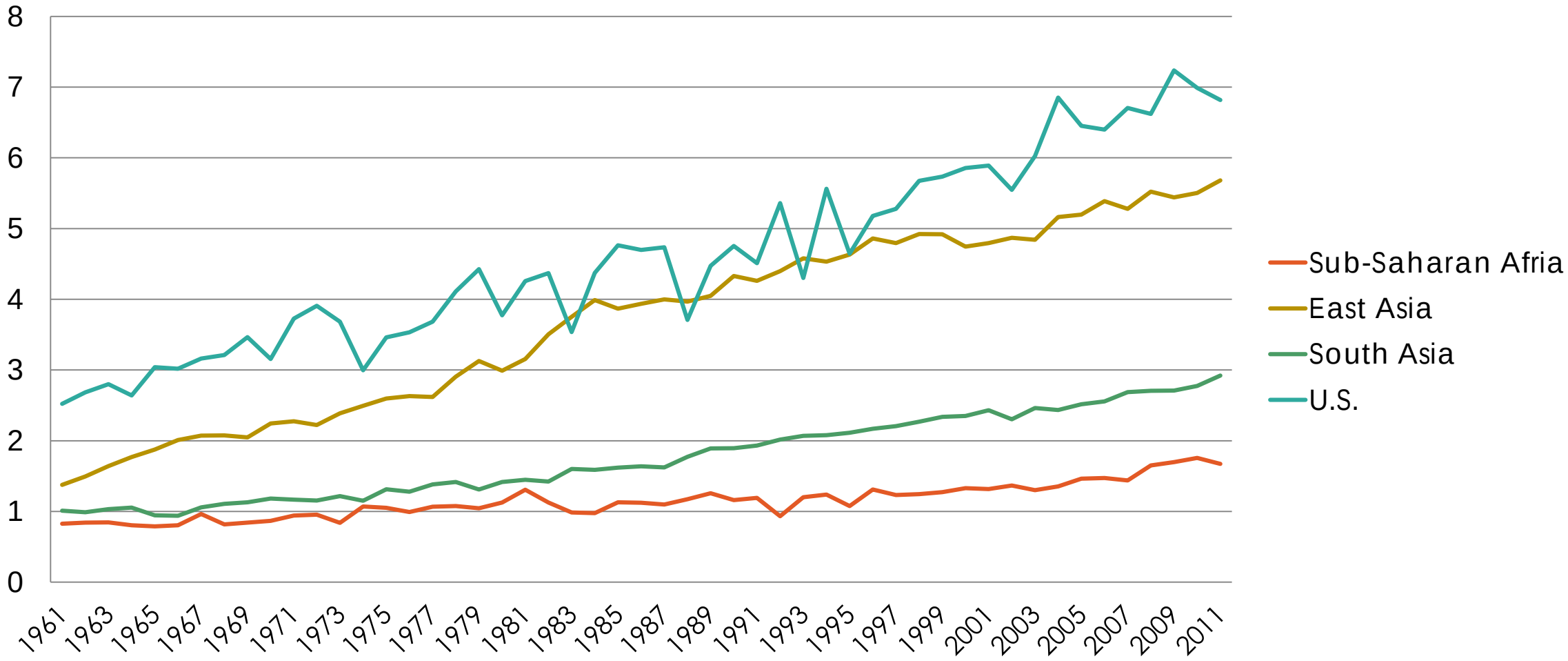


Since the start of ATAI

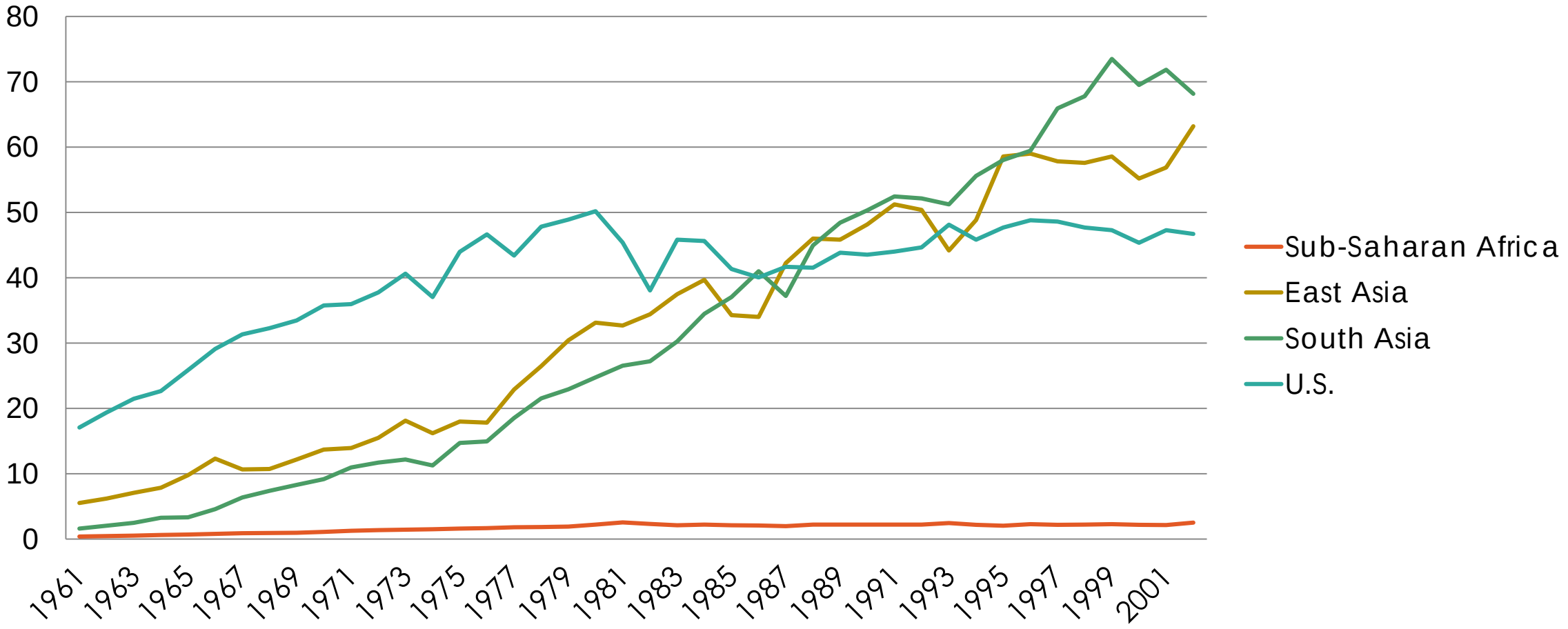
Category	Total
Farmers surveyed	111,351
Female farmers surveyed	47,845
Farmers whose behavior has changed	17,932
ATAI Awards	55
Unique ATAI projects	42
Countries with ATAI projects	14
Researchers on ATAI projects	89

What comes to mind when you think of agricultural technologies?

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. Constraints in Agriculture

II. Policy Lessons I: Information

III. Policy Lessons II: Credit

IV. Policy Lessons III: Risk

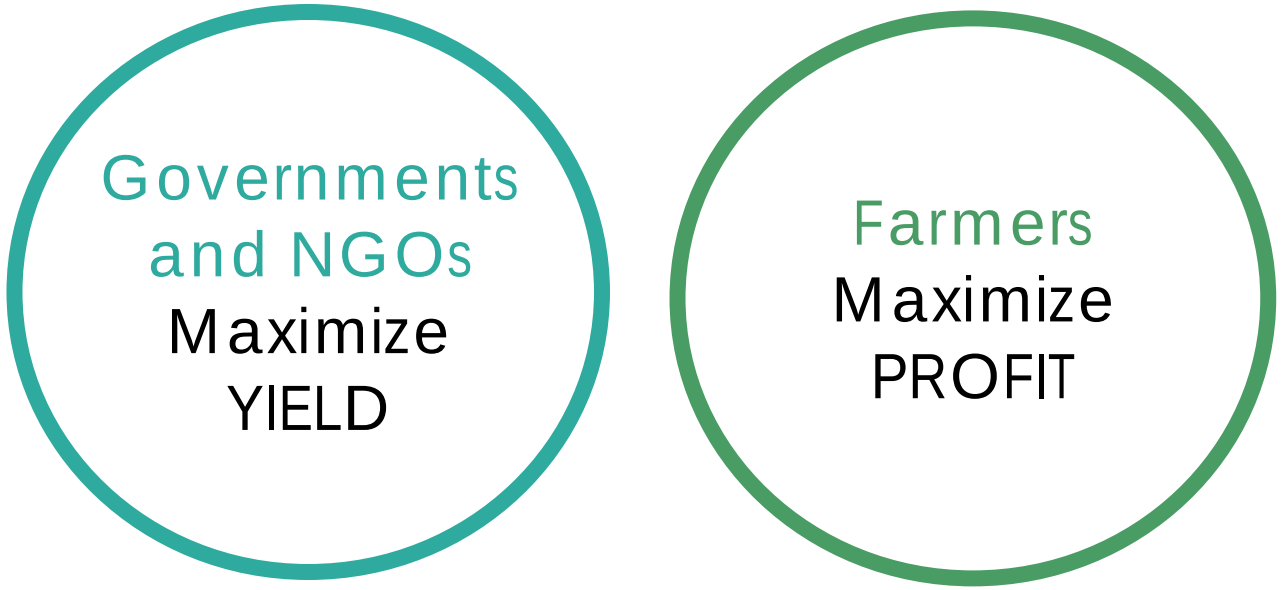
V. Policy Lessons IV: Input/Output Markets

VI. Conclusion

Preview: Information

- General extension is often ineffective
- Information given to farmers may be wrong
- Extension may be improved
  - Incentives
  - Feedback
  - Leveraging social networks
- Successes
  - ICT
  - New crops
  - Behavioral barriers

Profits vs. Yields



- Governments and NGOs provide advice is designed to maximize yield, rather than maximize farmer profit
- Farmer decisions are based on profit, not yield

Duflo et al. 2008, Hanna et al. 2013

Why do farmers need information?

- Learning about a new agricultural technology is a fundamentally hard learning problem
- Information helps famers assess novel technologies, their risk profile and potential profitability
- If a farmer is to use a new technology effectively they need to know:
  - That it **exists**
  - Something **about its benefits and costs**
  - How to **use it effectively**

What extension service model does your organization typically use?

How do farmers receive information?

- Government or NGO extension services
  - Test plots
  - Trainings
- Social learning
- Direct to farmers
  - Door-to-door
  - ICT

Often, traditional extension has limited effects

- Traditional extension often has relatively low impacts on adoption
  - Test plots
  - Farmer field schools
  - Train and visit
  - Training seed farmers

- Extension services have sometimes been ineffective because they promote a technology that is unprofitable.

Duflo et al 2008, Blair et al. 2013, Kondylis et al. 2014, Beaman et al. 2015, Duflo and Suri, forthcoming

And yet, potentially big costs to ignoring extension

- Upland Nerica Rice introduced in Sierra Leone
  - In villages where seeds coupled with extension, yields increased by 16%
  - In villages where seeds were simply distributed, yields fell
  - Without extension, would be hard for farmers to learn about yield potential

Glennerster and Suri, forthcoming

How to improve extension?

- Contracting
- Technology (ICT)
- Social Learning
- Behavioral Constraints

Improving extension services

- Incentives may improve adoption
  - Extension officers
  - Lead farmers
- Feedback on extension may help
  - Improves satisfaction
  - Improves knowledge in certain circumstances

BenYishay and Mobarak 2015, Ben Yishay et al. 2015, Jones and Kondylis 2015, Masset and Haddad 2014

ICT to reach farmers directly

- Interventions using mobile phones to provide information to farmers have been shown to increase adoption and improve yields

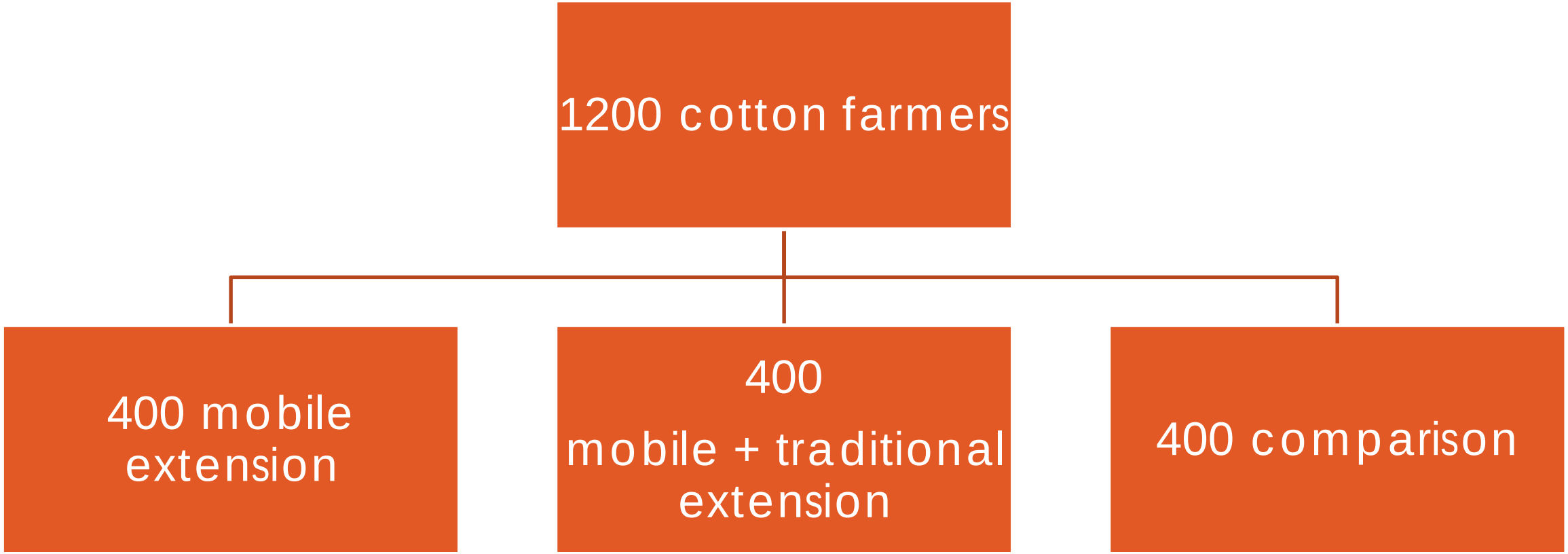
Cole and Fernando 2016, Casaburi et al. 2014

Mobile phone-based agricultural extension

- Gujarat, India
- 2011-2012
- Center for Microfinance
- Awaaz.De

Cole and Fernando 2014

Mobile Phone-Based Agricultural Extension in India



Cole and Fernando 2012, Cole and Fernando 2014

Mobile phone-based agricultural extension

- High take up and use of mobile platform
- Traditional extension had no effect
- Switch to more effective pesticides
- Increased adoption of cumin
- Some evidence of increased yields in cotton and cumin

Cole and Fernando 2012, Cole and Fernando 2016

Mobile phone-based agricultural extension

- High take up and use of mobile platform
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- Some evidence of increased yields in cotton and cumin

- Estimated return of $10 per $1 spent

Cole and Fernando 2012, Cole and Fernando 2016

Precision Agriculture for Development (PAD)

Gujarat, Kenya, Ethiopia

Based on India and (ongoing) Kenya ATAI RCTs:

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

Harnessing ICT to Increase Agricultural Production in Kenya (ATAI)

Casaburi et al. 2014

Social learning

- (Much) extension relies centrally on social learning for the last mile
  - Too expensive to train everyone who you hope to reach
- Lots of good evidence that social learning happens in agriculture
- Key question: How to design extension services to maximize social learning?
  - Breadth versus depth of treatment with limited resources

Ben Yishay et al. 2015, Beaman et al. 2015, Tjernstrom 2015, BenYishay and Mobarak 2013

Pit Planting in Malawi

- Malawi Department of Agriculture Extension Services (DAES) wanted to promote pit planting
- In villages, selected 2 lead farmers to train in pit planting
  - Business as usual (agent selection)
  - Selection so as many people as possible will be reached by one contact (simple contagion)
  - Selection so as many people as possible will be reached by two contacts (complex contagion)

Results

- Large differences in social learning comparing business-as-usual partner selection to Treatment partner selection
- 46% in Benchmark villages have no evidence of social learning after 3 years – compared to 16% of complex (2 contact) contagion villages
- Estimation: 70% of farmers need 2 contacts to adopt

Social learning

- The messenger matters
  - A farmer is more likely to demand a new technology if a greater proportion of his/her network is demonstrating it
  - Lead farmers most closely resembling target farmers were more effective at promoting a new technology
- Designing extension systems so that some farmers will be able to observe multiple data points is critical
  - need multiple demo plots or lead farmers per village – and intensity of exposure may be more important than equity

Ben Yishay et al. 2015, Beaman et al. 2015, Tjernstrom 2015, BenYishay and Mobarak 2013

Behavioral Barriers: Solving Procrastination

Timing the information

Reminders to use inputs

Duflo et al. 2011, Casaburi et al. 2014 , Cole and Fernando 2014

Behavioral Barriers:
Extension helps when learning is hard

Farmer-led experimentation

Simple tools to aid learning

Hanna et al. 2012, Duflo et al. forthcoming, Islam 2014

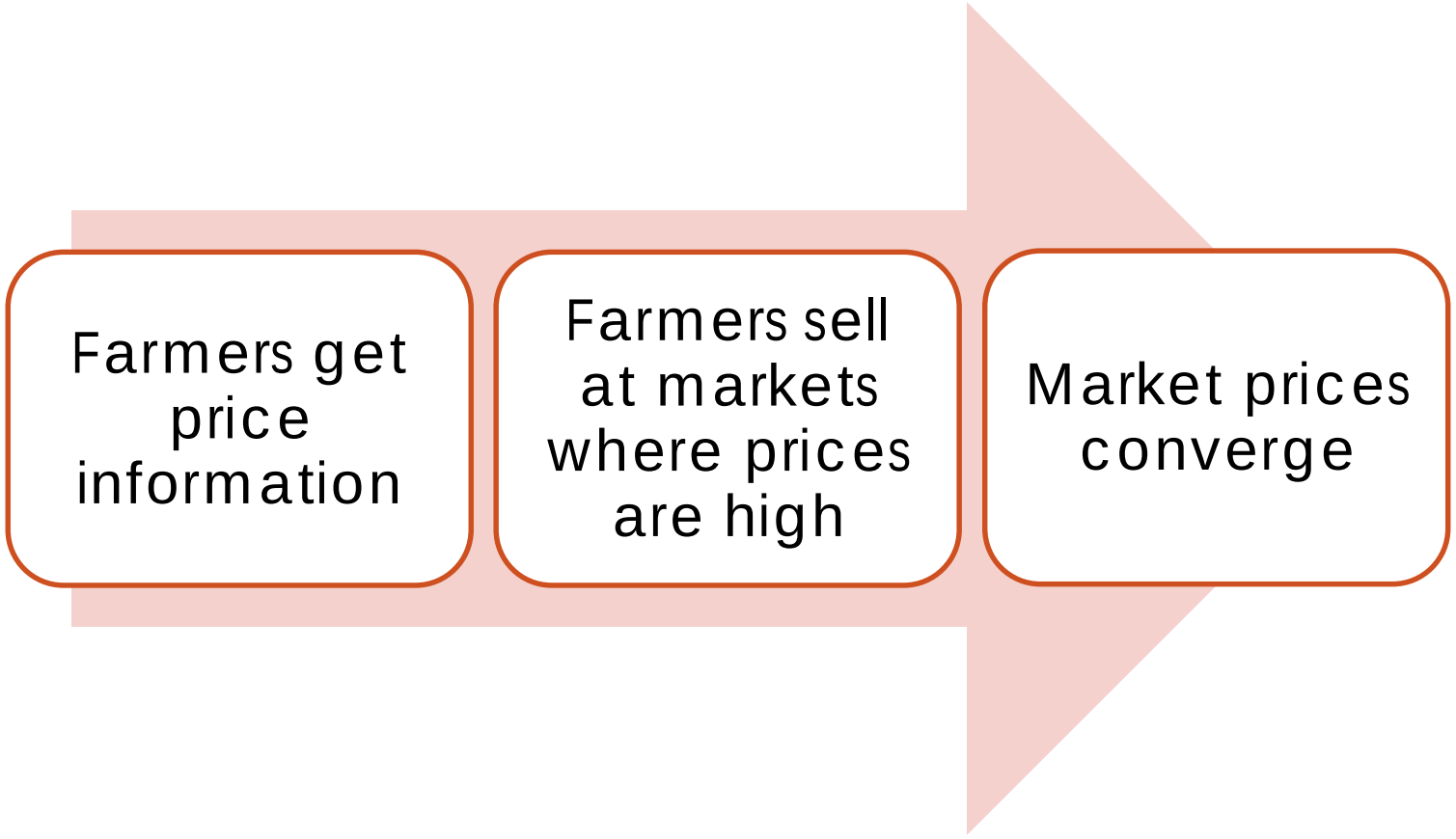
Ongoing Information Delivery Studies

- An Evaluation of Digital Green's Agricultural Extension Program in India
- Harnessing ICT to Increase Agricultural Production in Kenya (ATAI)
- Precision Agriculture for Development in India

Summary: Extension Services

- General extension is often ineffective
- Improved extension may be critical for new tech adoption:
  - When tech is not readily understood, and/or is complicated by heterogeneity
- Extension may be improved
  - Incentives
  - Feedback
  - Technology
  - Leveraging social networks
  - Adapting the pedagogical model
- Successes
  - ICT
  - New crops
  - Behavioral biases

Theory of price information



Price information to farmers

- Limited effect on prices
- Farmers may change behavior
- No gain on average for farmers

Goyal 2010, Fafchamps & Minten 2012, Mookherjee et al 2013

Price information to others

- Price information is actionable
  - Traders
  - Fishermen
- Reductions in price dispersion
- Potential improvement in profits

Aker 2010, Jensen 2007

Price Information Summary

- Price information to farmers
  - Unlikely to affect farmer incomes or price levels
  - Farmer lack bargaining power
  - Transport costs remain high
- Price information to intermediaries or producers
  - Market prices converge and producers may benefit

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

Conclusions

- A lot of specific information is necessary for farmers to make informed decisions on technology adoption
- In this information needy context: higher adoption can be achieved through increasing the efficiency of information transfer
- **Information is only useful to the degree that it is profitably actionable**

Thank you!

Kyle Murphy

kmurphy@povertyactionlab.org