



# Evidence in Agriculture: Input / Output Markets and ICTs

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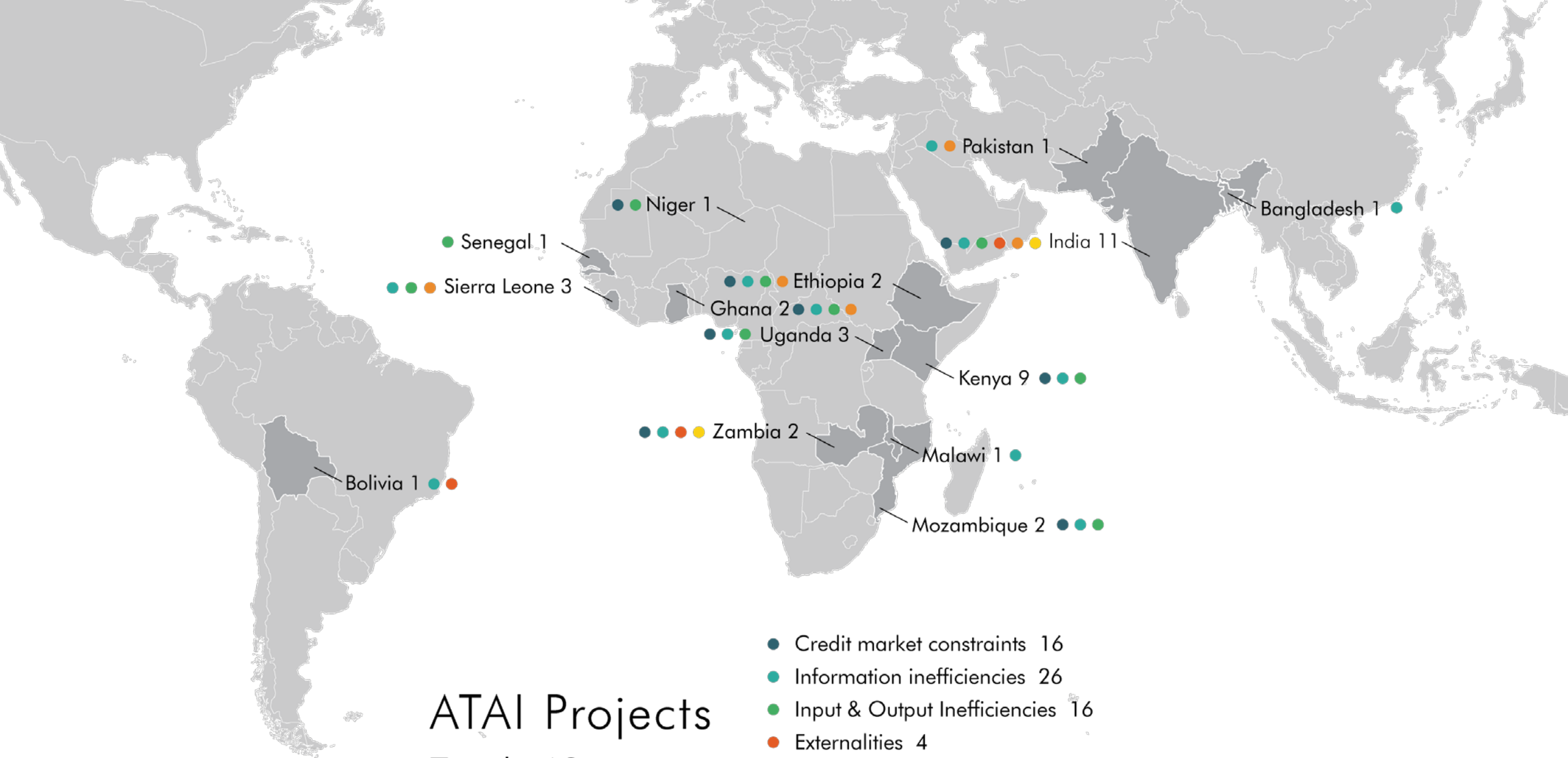


# Overview

- Background on J-PAL Agriculture Sector
- Constraints in Agriculture
- Policy Lessons: Input/Output Markets
- Evaluations of ICTs in Agriculture
- Conclusion

# Over 70 completed and ongoing J-PAL agriculture projects





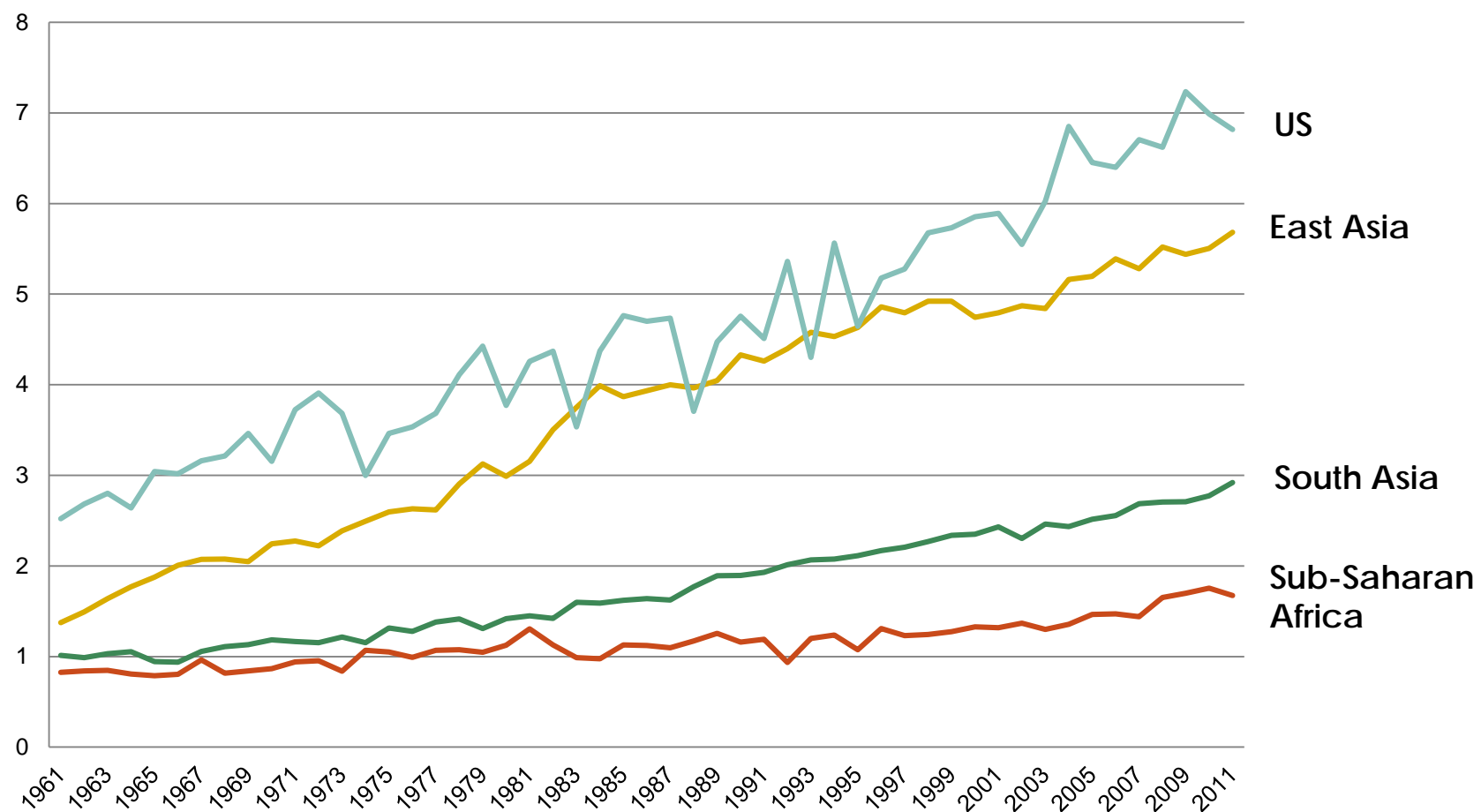
ATAI Projects  
Total: 40

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

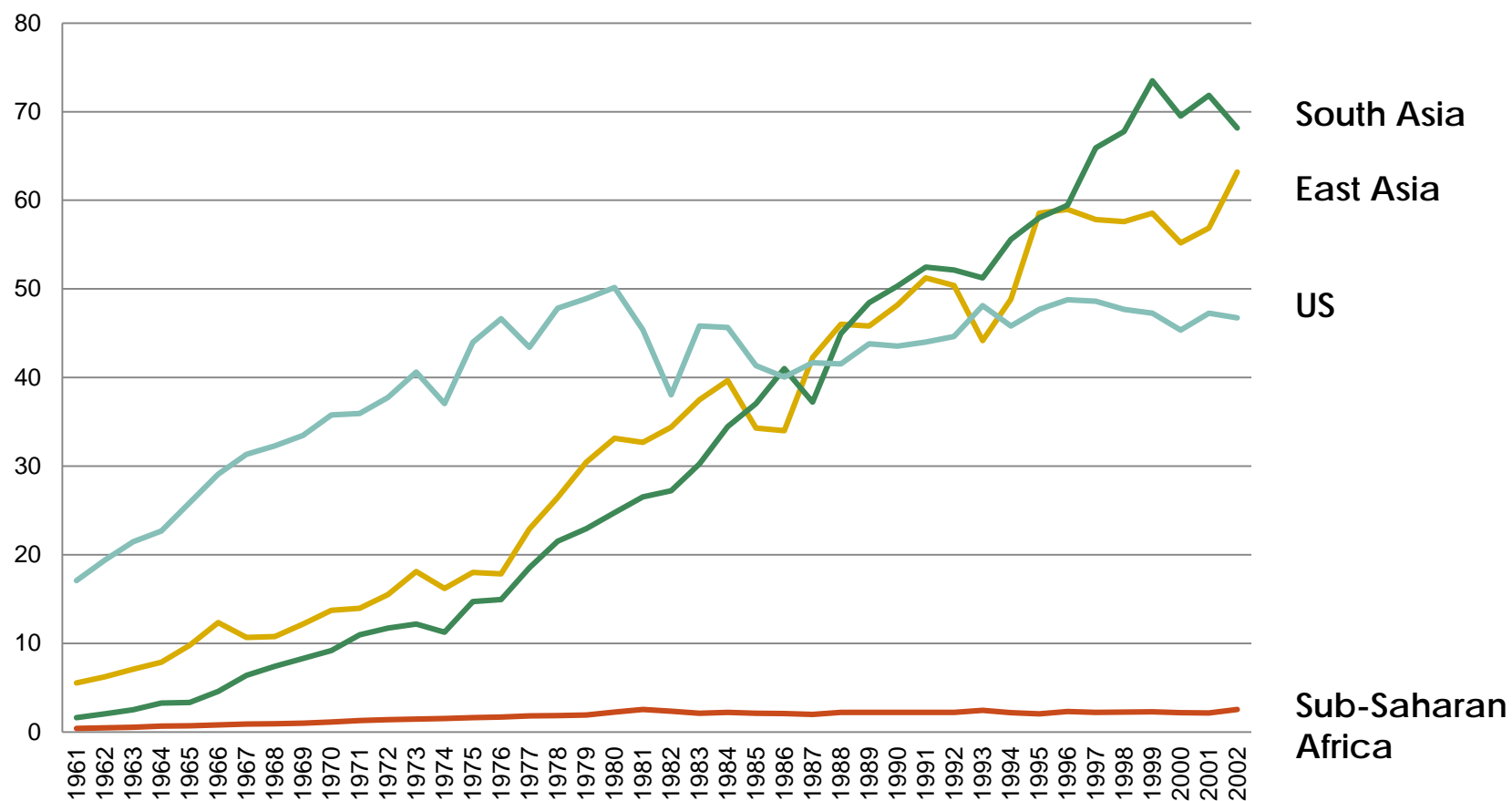
## Since the start of ATAI

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

# Cereal Yields (Metric Tons/Hectare)



# Fertilizer Use (Kilograms/Hectare)



What is hampering  
technology adoption?



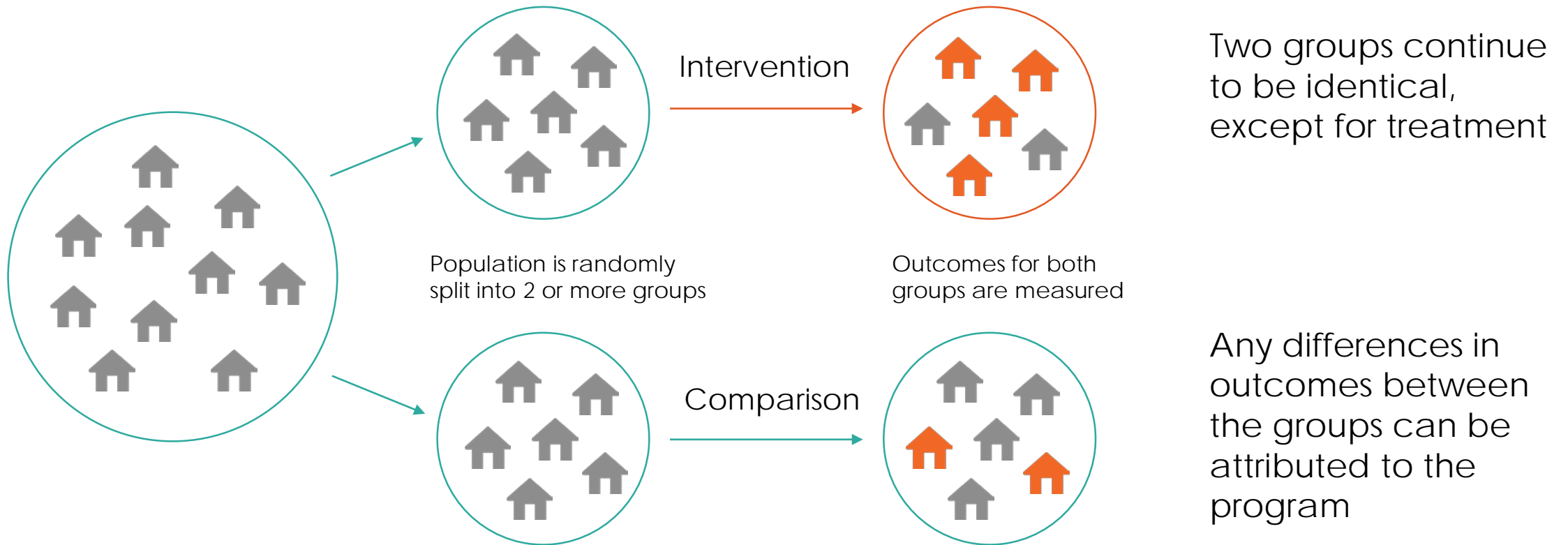


# Inefficiencies constraining tech adoption

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

# 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.



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## Preview: input/output markets

- Infrastructure investment can decrease transport and input costs
- Price information has no positive effects on farmers, though other members of the value chain may benefit

# Input and output market inefficiencies

Farmers may be unable or unwilling to adopt new technology due to barriers within:

## Input Markets

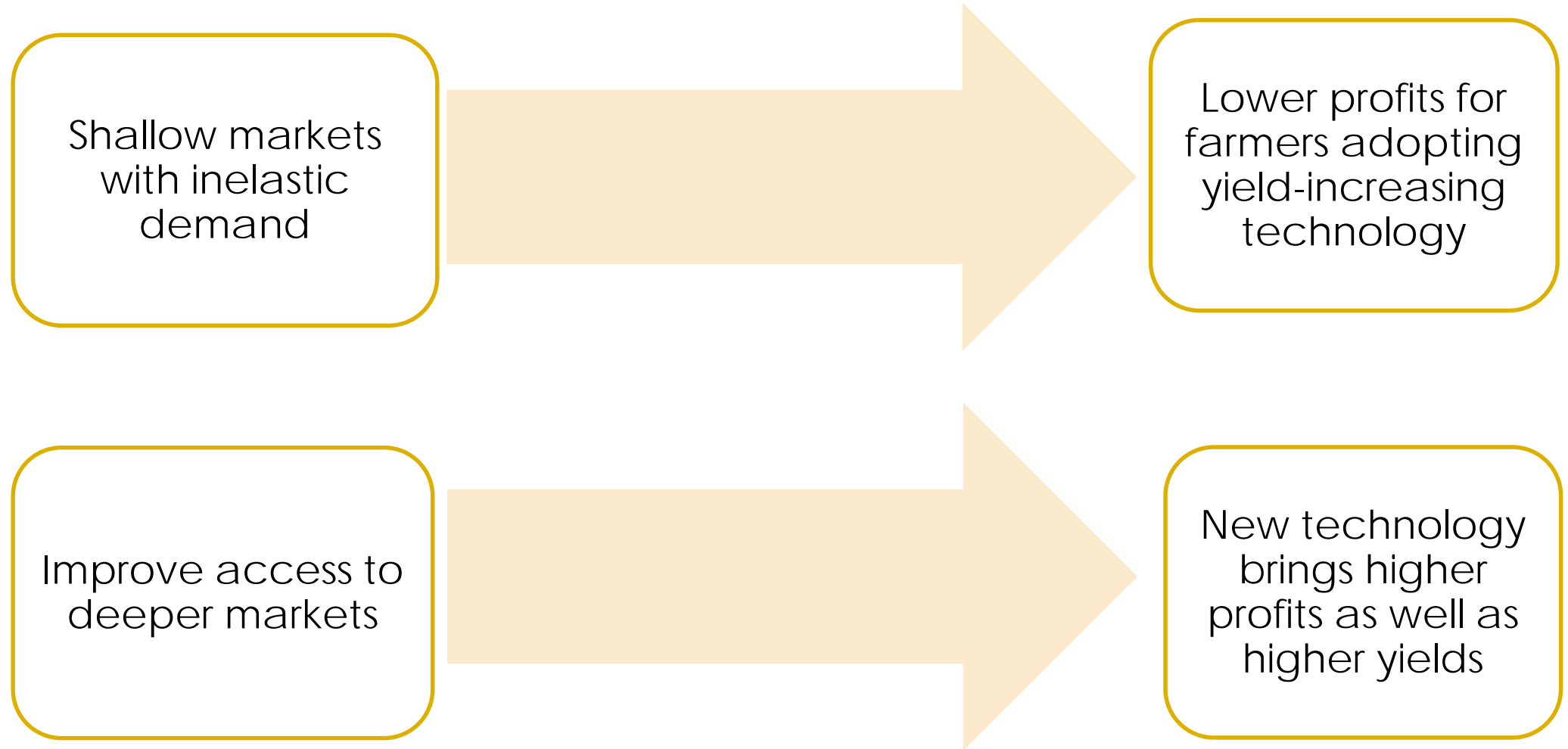
- Missing or incomplete supply chains
- Unprofitably high input prices

OR

## Output Markets

- Lack of access to additional markets
- Low prices for yields, including high quality crops

# Effects of market structure



# Road development in Sierra Leone



# Road development in Sierra Leone





# Infrastructure: road development

Investment in roads lowers transportation costs and may increase access to and use of inputs



[Casaburi et al. 2013](#)

# Theory of price information



# Impacts of price information

Members of value chains who can act on price information can benefit, whereas farmers are unlikely to experience benefits

## For farmers:

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

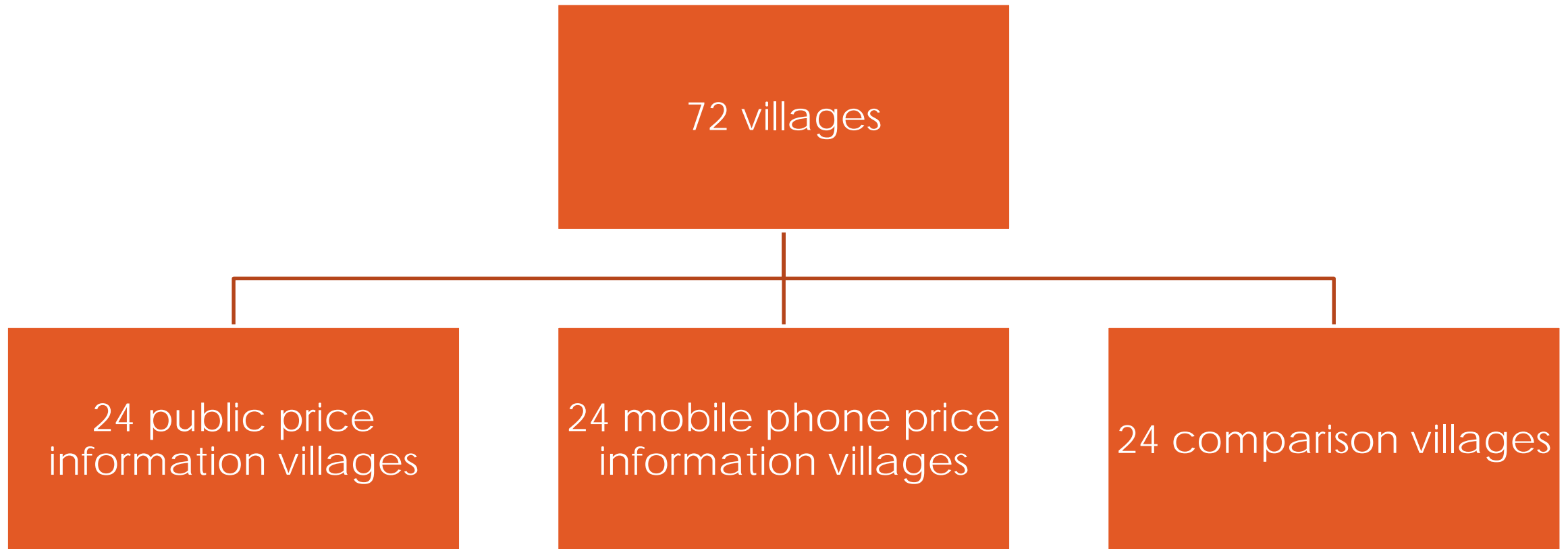
## For other actors in market:

- Price information is actionable for some actors in the value chain
  - Traders
  - Fishermen
- Reductions in price dispersion
- Potential improvement in profits

[Goyal 2010](#), [Fafchamps & Minten 2012](#), [Mookherjee et al 2013](#)

[Aker 2010](#), [Jensen 2007](#)

# Price Information to Indian Potato Farmers

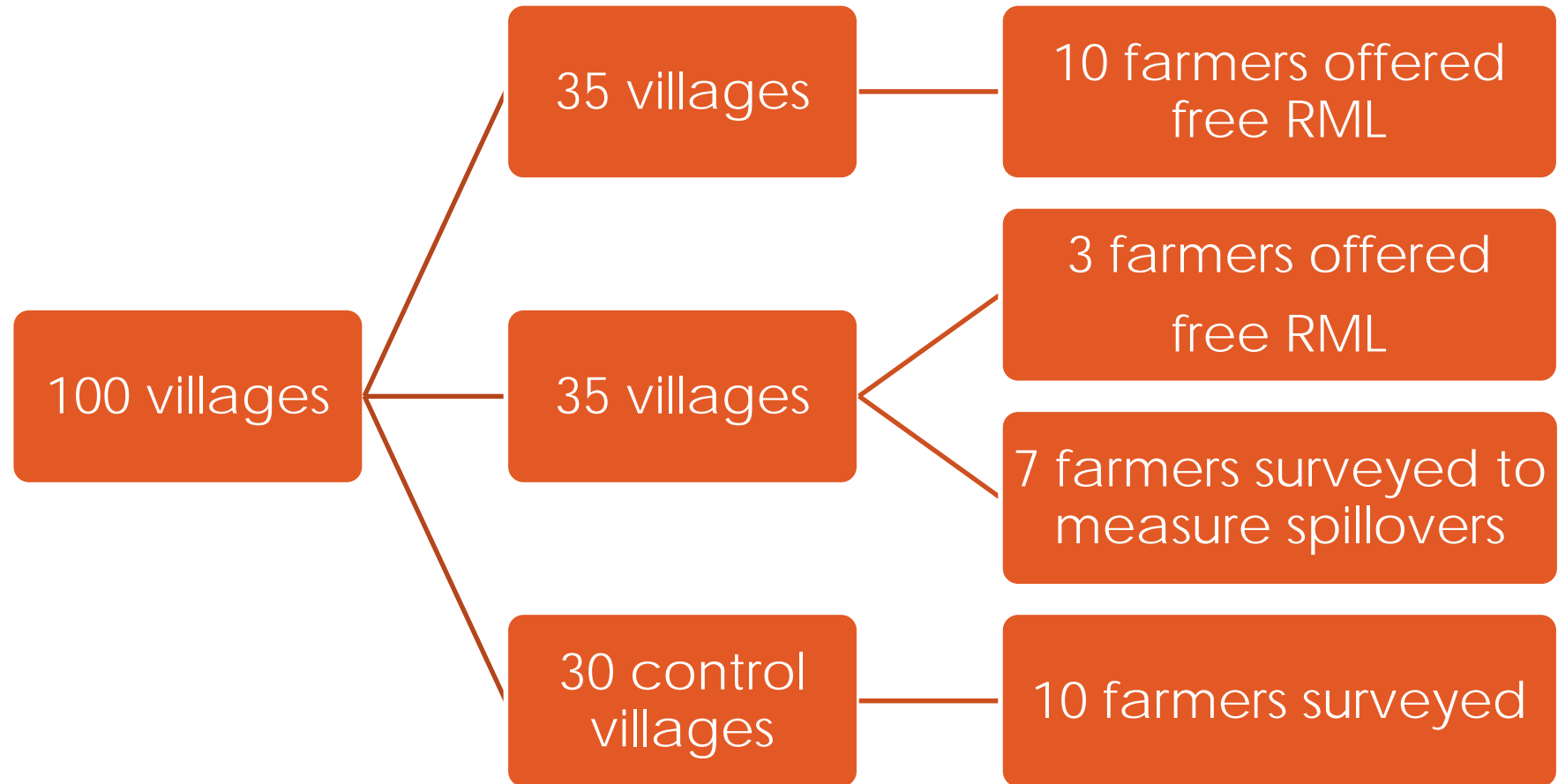


Mitra et al. 2015

# Price Information to Indian Potato Farmers

- Price information had no average effect
- Price information through the **mobile phone** affected farm behavior when prices were unexpected
  - Farmers sold more at higher prices
  - Farmers sold less at lower prices
- Farmers lack outside options, preventing them from realizing gains from knowledge of price

# Reuters Market Light (RML) Evaluation in India



Fafchamps and Minten 2012

# Reuters Market Light (RML) Evaluation in India

- Modest take up
- No effect
  - Price received by farmers
  - Crop value-added
  - Crop losses resulting from rainstorms
  - Planting different crops
  - Cultivation practices
- Small increases
  - Selling at new markets
  - Sorting crops by quality

Mitra et al. 2015

# Relationships between farmers and traders

- Trader relationships differ across contexts
- 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
  - Kenya: dairy farmers preferred to sell to coops and receive lower, bulked payments than sell to traders and receive daily payments
  - India: potato farmers' ex-post bargaining relationships with traders limited the effectiveness of price information

[Casaburi et al 2014](#); [Casaburi and Macchiavello 2016](#); [Mitra et al 2015](#)



# 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

# Summary: input/output markets

- Price information has no positive effects on farmers, though other members of the value chain may benefit
- Infrastructure investment can decrease transport and input costs

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# Types of ICT Interventions in Agriculture

1. Digital Financial Services
2. Information Delivery
  - Farming practices and inputs
  - Market prices
3. Interactive Platforms
  - Review services
  - Share with neighbors
  - Connect with the market

# Digital Financial Services



# Mobile Money in Context

## Credit Supply

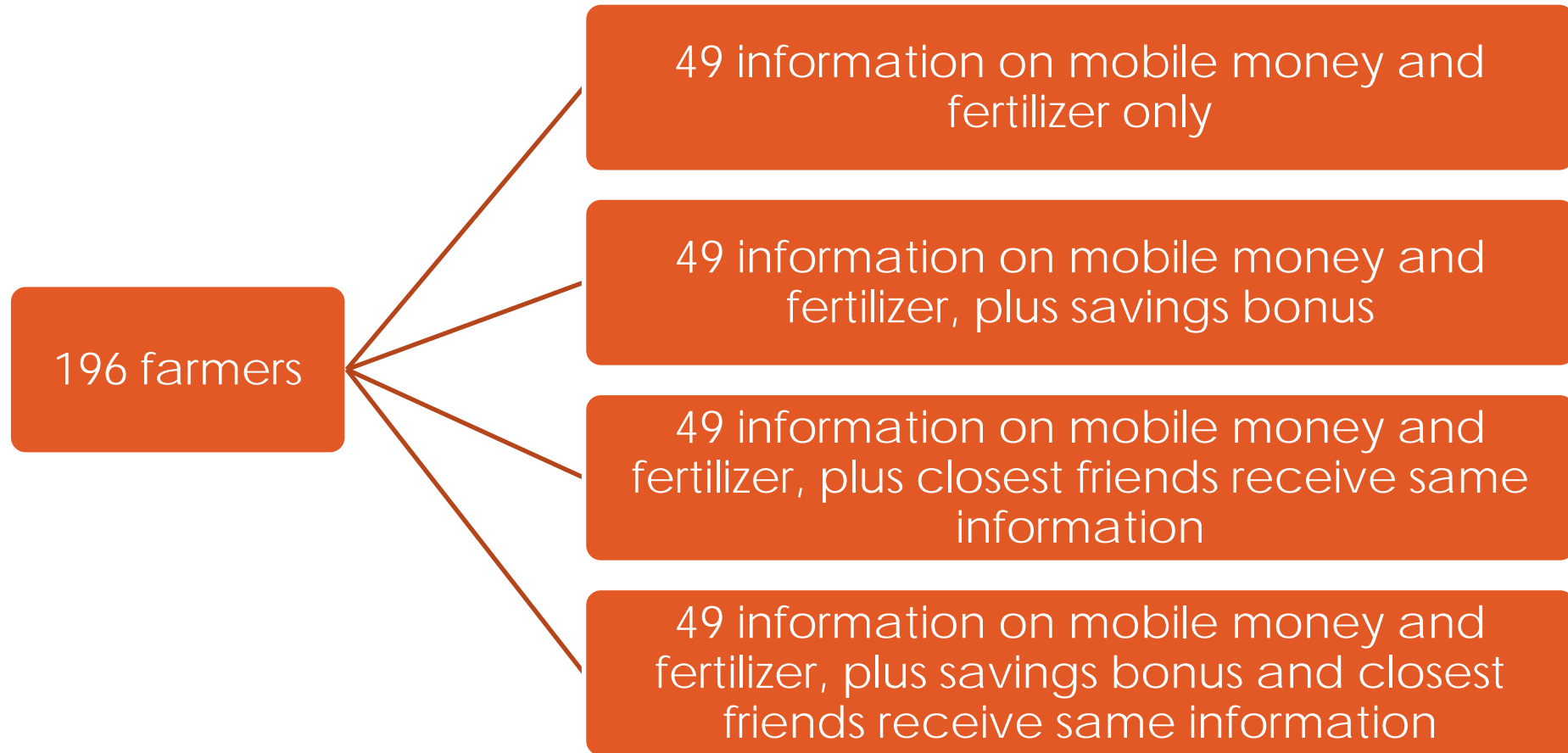
- Microfinance model is inappropriate for farmers
- Banks often do not lend to the agricultural sector
- Interventions
  - Digital financial services
  - Improved information about borrowers

## Credit Demand

- Lack of credit is unlikely the primary constraint
- Take up of credit is low
- Interventions
  - Flexible collateral
  - Seasonal variation of farmer income
  - Labeling

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

# Mobile Money in Mozambique



Batista et al. 2015 (preliminary)

# Mobile Money in Mozambique

- Effects of savings bonus
  - Increased use of mobile money, including deposits
  - Increased non-frequent expenditures
  - Increased probability of fertilizer use
  - Decreased social pressure to share resources
- Effects of social network
  - Increased use of mobile money
  - Decreased social pressure to share resources

Batista et al. 2015 (preliminary)



# Information Services



# Information Delivery in Context

- Agricultural extension is the most common model
- Use of traditional extension services is low
  - Unprofitable technology
- Extension can be effective
  - Overcoming a behavioral bias (procrastination)
  - New or novel technologies (risk reducing seeds)
  - Incentivizing trainers
  - Mobilizing networks (similar farmers, multiple farmers)
  - Providing accessible, tailored, and timely information

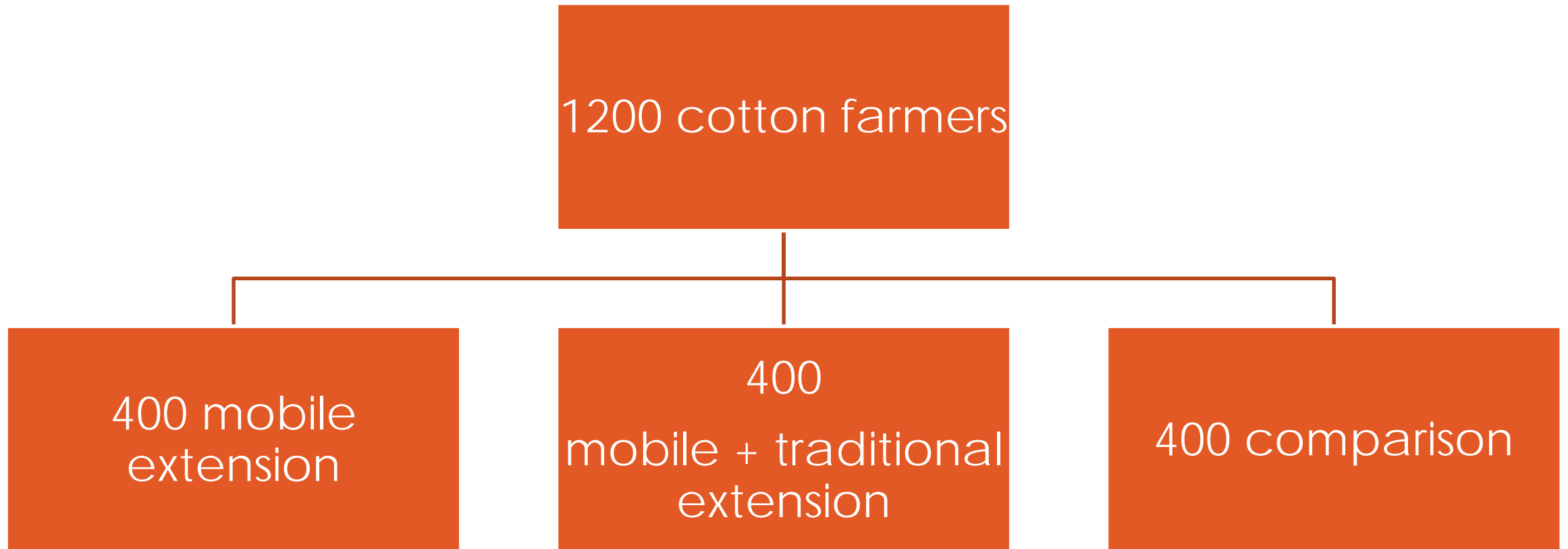
Beaman et al. 2015, BenYishay & Mobarak 2014, BenYishay et al. 2015, Blair et al. 2013, Casaburi et al. 2014, Cole & Fernando 2012, Duflo et al. 2008, Duflo et al. forthcoming, Hanna et al. 2012, Islam 2014, Kondylis et al. 2014, Tjernstrom 2015, Waddington et al. 2014

# Mobile Phone-Based Agricultural Extension in India



Cole and Fernando 2012, Cole and Fernando 2014

# Mobile Phone-Based Agricultural Extension in India



Cole and Fernando 2012, Cole and Fernando 2014

# Mobile Phone-Based Agricultural Extension in India

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

Cole and Fernando 2012, Cole and Fernando 2014

# Harnessing ICT to Increase Agricultural Production in Kenya



Casaburi et al. 2014 (forthcoming)

# Harnessing ICT to Increase Agricultural Production in Kenya

- High take up of the SMS and hotline interventions
- SMS messages lead to 11.5% yield increases
- Access to hotline decreased:
  - 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)



# 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



# Price Information Review

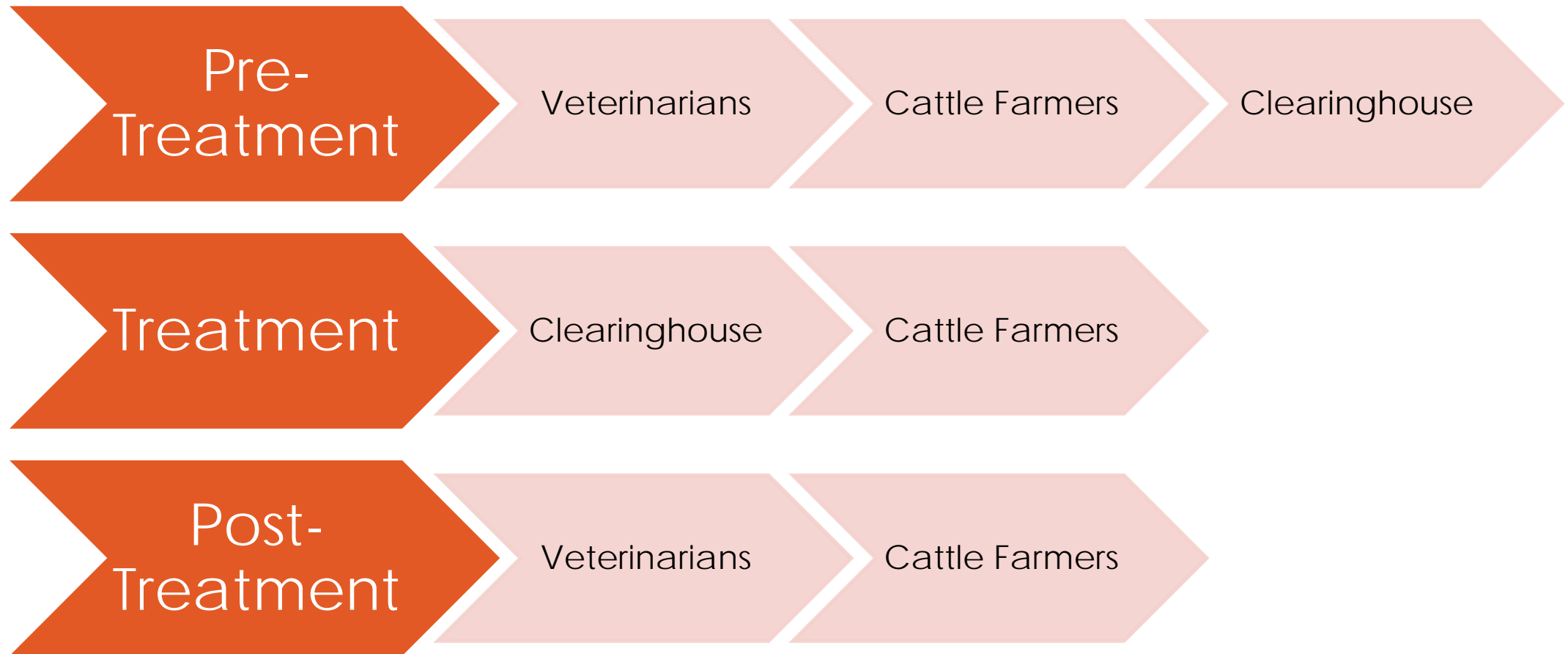
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# Interactive Platforms



# Coordinating Farmers with Cellphones in Pakistan



Rezaee et al. 2015

# Coordinating Farmers with Cellphones in Pakistan

- More likely to return to government service provider rather than a private provider
- Higher insemination success
- Lower prices for insemination services

Rezaee et al. 2015

# Ongoing Interactive Platform Studies

- Market Interventions (ATAI)
  - Building Market Linkages in Uganda
- Agricultural Information
  - Precision Agriculture for Development (PAD)
    - India, Kenya, and Ethiopia

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- Infrastructure investment can decrease transport and input costs
- Price information has no positive effects on farmers, though other members of the value chain may benefit
- ICT in agriculture can offer digital financial services, share information or facilitate interactive platforms
- **But, information is only useful to the degree that it is profitably actionable**



Thank you!

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