Productivity gap

Agricultural productivity (cereal yield)
Productivity gap

Agricultural productivity towards rural transformation

- Green Revolution has not yet reached rainfed areas
  - increase in production comes from extensification rather than intensification of agriculture
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  - transfer of labor from agriculture to industry and services
  - reduction of rural poverty
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- How to retarget investments to increase agricultural productivity?
Where does the money go?

- Recent public expenditure review of agricultural investments across SSA reveals that (Goyal and Nash 2016)
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- Investment is low relative to other developing nations during their Green Revolution
Where does the money go?

- Recent public expenditure review of agricultural investments across SSA reveals that (Goyal and Nash 2016)
- Investment is low relative to other developing nations during their Green Revolution
- Composition of the spending
  - dominated by input subsidies [30-70%], extension and advisory services [~35% in Ethiopia, Uganda]
  - very small shares allotted to R&D, infrastructure projects (irrigation, access to markets)
Typical bundled agricultural investment

- Extension
- Financial constraints
- Institutional constraints
- Infrastructure
- Market access

Targeting, Gender, Complementarities
Role of impact evaluations

Distributional impacts of bundles (Bangladesh IAPP)

Source: Jones Kondylis Mobarak Stein 2016

Monetary values are in USD.
Role of impact evaluations

Distributional impacts of bundles (Rwanda LWH)

Source: Jones Kondylis 2016
Role of impact evaluations

Impact evaluations to help retarget investments

- Use IEs to retarget implementation, testing
  - various modalities to document constraints and opportunities
  - for complementarities in the production function
Role of impact evaluations

**Impact evaluations to help retarget investments**

- Use IEs to retarget implementation, testing
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- Refine targeting of recipients across instruments aiming to
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  - increase productivity towards rural transformation
Role of impact evaluations

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  - various modalities to document constraints and opportunities
  - for complementarities in the production function
- Refine targeting of recipients across instruments aiming to
  - provide social protection
  - increase productivity towards rural transformation
- Build causal evidence to motivate budgetary reallocations
Building a strong evidence base (N=33)

Regional Distribution

- AFR: 61%
- SAR: 18%
- LCR: 18%
- EAP: 3%

Evaluation Method

- Both: 55%
- Experimental: 24%
- Non-experimental: 21%

Agriculture Portfolio Distribution

- Institutional constraints: 9%
- Markets: 15%
- Extension: 18%
- Financial constraints: 21%
- Infrastructure: 26%

Number of Treatment Arms

- 1: 41%
- 2: 30%
- 3: 19%
- 4: 11%

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Retargeting Agricultural Investments
Iterative adoption trials

Do extension systems make sense with the way farmers learn?

- Recent field experiments testing different modalities

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  - Challenges with decentralized extension networks, but providing centralized training helps (Kondylis et al. 2016)
    - performance-based incentives double impact (BenYishay Jones Kondylis Mobarak 2016)
    - leveraging social networks (Beaman et al. 2016)

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- Farmers learn from each other—but is that the efficient allocation? [Jones Kondylis Mobarak Stein 2016]
- Demand-side issues
  - Feedback tools boost farmers’ demand for extension [Jones and Kondylis 2016]
Women’s participation in extension services

- As suppliers:
  - Gender discrimination in extension service provision in Malawi
    - BenYishay Jones Kondylis Mobarak 2016
  - Work in Mozambique suggests gender frictions may be at play in some contexts (Kondylis et al 2016)
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- **As users:**
  - Feedback tools in Rwanda has largest impact on female farmers’ attendance
  - Lift gender-specific constraints to boost attendance, e.g. childcare (O’Sullivan et al 2014)
A lot more to do

- Measurement
  - Hard to measure learning (Laajaj and Macours 2017; Kondylis et al 2015)
  - Target farming capacities (e.g. SME growth literature)
  - Crowding out other experimentation?
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  - Thin market issues
Future work

A lot more to do

- **Measurement**
  - Hard to measure learning (Laajaj and Macours 2017; Kondylis et al 2015)
  - Target farming capacities (e.g. SME growth literature)
  - Crowding out other experimentation?

- **Low amounts spent on R&D**
  - Agricultural technologies may not pass the profitability bar
  - Thin market issues

- **Lack of a robust effect of extension on yields suggests content of extension trainings may not be valuable**
  - Tailor recommendations to local conditions (Carter et al; Gine et al)
Sustainability issues

Costs and benefits of irrigation

- Irrigation investments have enormous potential
  - increasing yields
  - adding cultivating seasons
  - reducing risk
Sustainability issues

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- Irrigation investments have enormous potential
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Costs and benefits of irrigation

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- These benefits come at substantial costs, even when cost recovery is not an objective
  - farmers are responsible for recurring Operation & Maintenance costs (O&M)
- Costs must be weighed against benefits of second-best products, since commons problems affect water access
Success requires that

- Farmers adopt higher-value crops
  - in Rwanda’s new schemes, only 5% of farmers practice commercial farming
  - combining escalating fees and minikits (Jones et al)

  minikits and fees
Success requires that

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- Governance structure ensures adequate O&M of system (Olson 1965; Ostrom 2003)
  - only 1/3 of land equipped with irrigation is actually irrigated
  - targeting to affect make up of Water User Associations in Mozambique (Christian et al)
Availability and heterogeneity

- Low take up of inputs may be explained by
  - Lack of market availability
  - High input/output price heterogeneity
Low take up of inputs may be explained by
- Lack of market availability
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Future areas of work
- Certification trial with vouchers in Uganda (Carter et al)
- Certifying smaller bags to boost use among female farmers (O’Sullivan et al 2014)
Land

Property rights towards rural transformation

- Countering sub-optimal farm size, allowing (Lucas 1978; Restuccia and Adamopoulos 2014; de Janvry et al 2015; Deininger et al 2017)
  - higher investment
  - gains from trade
  - labor reallocation to wage economy
Motivation
Knowledge
Irrigation
Markets & Institutions
Finance
Conclusion

Property rights towards rural transformation

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  - higher investment
  - gains from trade
  - labor reallocation to wage economy

- RCTs are a recent addition to this literature
  - steps in the causal chain of these programs (Goldstein et al 2015)
    - find important changes in investment after demarcation, before certificates are issued
Evidence moving forward

- Policy Research Talk on Index Insurance by Xavier Gine
Financial constraints

Evidence moving forward

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- Allocating input vouchers through lottery/village identification (Gine and Patel)
  - lottery yields more equitable outcomes, as long as secondary market can operate

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Evidence moving forward

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- Ongoing work on matching grants for commercial farmers organizations in LAC (Kondylis, Piza, Zwager)
- Recent null/low adoption results on savings programs/insurance products (Jones et al; Gine et al; Cole et al)
  - These products may just be bad
  - Farmers may have low levels of trust
  - Can IT help (SMS reminders/digital lockboxes)? (Aker et al)
Areas for future work

- Experiment with targeting across different policy instruments
  - Social protection vs Productivity growth
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- Work closer with private sector
  - Input certification and packaging, contracts
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- Experiment with targeting across different policy instruments
  - Social protection vs Productivity growth
- Work closer with private sector
  - Input certification and packaging, contracts
- Invest in data systems to capture process of structural transformation
  - capture moves in/out of agriculture, changes of ownership, farm size, market structure
  - household surveys will not be enough
Conclusion

Thanks to

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Retargeting Agricultural Investments
Decentralized networks

Contact farmers

- Decentralized models assume that information flows from
  - researchers to extension agents, and
  - from extension agents to contact farmers (CFs)
  - CFs should then train other farmers in their communities
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Decentralized networks

**Contact farmers**

- Decentralized models assume that information flows from
  - researchers to extension agents, and
  - from extension agents to contact farmers (CFs)
  - CFs should then train other farmers in their communities

- Such a modality may fail to address informational inefficiencies and accountability issues

- In Mozambique, ran a RCT to learn about information transmission across nodes of the network
  1. shock network with new technology (Conservation ag, SLM)
  2. provide direct training on the technology to a random subset of CFs
Does information get lost in the network?

- From extension agent to contact farmer? **Yes**
  - adding a direct training led to a 20% increase in demonstration of the new technology
  - benefits of adoption are enough to ensure cost effectiveness (37% increase in yields; 0.37 SD reduction in labor)
Decentralized networks

Does information get lost in the network?

- From extension agent to contact farmer? Yes
  - adding a direct training led to a 20% increase in demonstration of the new technology
  - benefits of adoption are enough to ensure cost effectiveness (37% increase in yields; 0.37 SD reduction in labor)
- Is that increase in demonstration enough to trigger adoption among other farmers? No
  - but farming proximity to the source increases adoption by 75%, relative to the control
Experiential learning

Learning from self and Learning from others

Given a certain amount of demonstration resources, what is the optimal allocation?

In particular, what is the relative role of self-experimentation w.r.t. learning from others?
Learning from self and Learning from others

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  - seed variety trial
Learning from self and Learning from others

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  - In particular, what is the relative role of self-experimentation w.r.t. learning from others?
- We embed a field experiment in a GAFSP-supported government program in Bangladesh (IAPP)
  - seed variety trial
- We randomly vary the number of experimenters across villages to learn about optimal allocation of demonstration resources
Experiment

Regular demonstration plot
17 villages

Shared demonstration plot
19 villages

Self-demonstration
21 villages
Demonstration buzz

How many actual demos in SN in Yr0?

- Regular Demo
- Shared Demo
- Self Demo

(N = 272) (N = 324) (N = 333)
Self-demo increases adoption in Year 2

Household adopted growing crop in Year 2

- Regular Demo: 49.5% (N = 272)
- Shared Demo: 50.9% (N = 324)
- Self Demo: 63.9% (N = 333)
Self-demo increases area under new crop

Share of total cultivated area used for crop in Year 2

- Regular Demo
- Shared Demo
- Self Demo

(N = 272) (N = 324) (N = 333)

11% 11.5% 17.2%
Experiential learning

Ratio of learning from self vs from others o.t.o. 4.5:1

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Retargeting Agricultural Investments
Implications for extension policy

- Our findings reject the idea that social learning is very large relative to self experimentation
Implications for extension policy

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- This suggests a need to break away from traditional extension systems.
Implications for extension policy

- Our findings reject the idea that social learning is very large relative to self experimentation
- This suggests a need to break away from traditional extension systems
- Encouraging farmers to experiment and innovate in their own farming conditions may be the most productive use of demonstration resources
  - Further testing is needed to move closer to the efficient frontier and increase productivity in agriculture
Feedback matters

Attendance in extension trainings is low

Do you go to the extension trainings?

Not very much!

Attend at least one training: 37% of men

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Retargeting Agricultural Investments
Feedback matters

Attendance in extension trainings is low

88% of groups lose at least 1 member each season
A group of 12 farmers loses about 4 members
Feedback matters

Feedback tools

ITSINDA A:
1.A.1. SERIAL NUMBER:  
1.A.2. Izina ry'itsinda rya TUBURA

ITSINDA B: GUTAHURA INDWARA

2.B.1
2. Section C

2.B.2

1=Yego
2=Oya

1=Ndayishimiye
2=Ndayishimiye
3=Sinkishimiye

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Feedback matters

Sign up increases

<table>
<thead>
<tr>
<th>Scorecard Treatment</th>
<th>New users joined group (Yes/No)</th>
<th># New users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logbook Treatment</td>
<td>0.28** × 3</td>
<td>0.61</td>
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<tr>
<td>Control mean</td>
<td>0.08</td>
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<table>
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<tr>
<th>Logbook Treatment</th>
<th>Users dropped out (Yes/No)</th>
<th># Drop outs</th>
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</thead>
<tbody>
<tr>
<td>Control mean</td>
<td>0.29** × 3.5</td>
<td>-0.44***</td>
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</table>

Observations: 180
Feedback matters

**Use increases**

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th></th>
<th>Women</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attended training</td>
<td># trainings attended</td>
<td>Attended training</td>
<td># training attended</td>
</tr>
<tr>
<td>Scorecard Treatment</td>
<td>0.03 [0.08]</td>
<td>1.33*** [0.38]</td>
<td>0.25** [0.10]</td>
<td>0.97* [0.53]</td>
</tr>
<tr>
<td>Logbook Treatment</td>
<td>-0.07 [0.06]</td>
<td>0.67** [0.27]</td>
<td>0.14** [0.07]</td>
<td>0.86** [0.41]</td>
</tr>
<tr>
<td>Control mean</td>
<td>0.38</td>
<td>1.85</td>
<td>0.18</td>
<td>1.47</td>
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<tr>
<td>Observations</td>
<td>887</td>
<td>830</td>
<td>573</td>
<td>514</td>
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</tbody>
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*Florence Kondylis*

*Retargeting Agricultural Investments*
Implications

- In the context of a private extension system, feedback tools increased
  - attendance among current users
  - sign up among non-users
Feedback matters

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- Comparing different types of feedback tools shows that these effects are not due to anchoring
Feedback matters

Implications

- In the context of a private extension system, feedback tools increased attendance among current users and sign up among non-users.
- Comparing different types of feedback tools shows that these effects are not due to anchoring.
- Used RCT to show these effects are not simply the result of additional monitoring.
Implications

- In the context of a private extension system, feedback tools increased:
  - attendance among current users
  - sign up among non-users

- Comparing different types of feedback tools shows that these effects are not due to anchoring.

- Used RCT to show these effects are not simply the result of additional monitoring.

- Accountability appears to be a substantial constraint in extension networks.
Assigning the gender of contact farmers

- **Treatment**
  - designated and trained CFs
  - assigned gender

- **Control**
  - *shadow LFs*, not trained

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The role of incentives

>> identify gender-specific barriers to delivering agricultural service
Discrimination contributes to the gender gap

- Female communicators outperform male counterparts in acquiring, retaining information about a new technology, and applying it on their own farms.
Discrimination contributes to the gender gap

- Female communicators outperform male counterparts in acquiring, retaining information about a new technology, and applying it on their own farms.
- Despite this relative zeal, female communicators’ performance drops in relative terms when asked to convince others.
  - Results document a gender perception bias.
Discrimination contributes to the gender gap

- Female communicators outperform male counterparts in acquiring, retaining information about a new technology, and applying it on their own farms.
- Despite this relative zeal, female communicators’ performance drops in relative terms when asked to convince others.
  - Results document a gender perception bias.
- Incentives help mitigate these issues:
  - Increase farmers’ exposure to female communicators.
  - Reduce gender perception bias.
Do irrigation fee subsidies induce experimentation?

Lotteries for Water Fee Subsidies

- Escalating fees over first 2 seasons
  - Control (no subsidy)
  - Half, Low
  - Full, Low
  - Full, Full
Irrigation fee subsidies affect minikit pickup (Rwanda)

Source: Jones, Kondylis, Loeser, Magruder 2017
Who gets the irrigation kit?

Constraints:
- Has to be close to the river
- Footprint is either 5-10 Ha
- Avoid forest cover

Ex ante not clear who should get it
- Don’t know who will benefit most from irrigation
- Different group structures might better maintain equipment. (Olson, 1965; Ostrom, 2003)

Source: Christian Garg Kondylis Zwager 2017

- Local community may have more information about who benefits most (Basurto, Dupas, Robinson, 2015)
- Costs of mismatch might be substantial (Jack, 2013)
- risk that the most powerful person in the community will take the kit (Acemoglu, Reed, and Robinson, 2013)
Testing two targeting models

**Smallholder model:** the district office extension agent administers the priority test.

**Decentralized model:** the community leadership provides a list of the identified recipients.

Source: Christian Garg Kondylis Zwager 2017
Smallholder treatment includes more farmers in target group

Source: Christian Garg Kondylis Zwager 2017

Percent of people selected for kit who report cultivating between .5 and 2 Ha of Land

<table>
<thead>
<tr>
<th>Smallholder Priority</th>
<th>55%</th>
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<tbody>
<tr>
<td>Decentralization</td>
<td>42%</td>
</tr>
</tbody>
</table>
Lack of seed availability in the market hinders adoption

Source: Emerick, de Janvry, Sadoulet 2016

Source: Emerick, de Janvry, Sadoulet 2016
Availability of urea is unequal across Rwandan markets

Source: Gonzalez-Navarro, Jones, Kondylis 2017
High price heterogeneity across Rwandan markets

Source: Gonzalez-Navarro, Jones, Kondylis 2017