DIRTS: Addressing Constraints to Agricultural Transformation in Northern Ghana

Christopher Udry
Professor of Economics
Northwestern University

9 May 2018
Maize Yields in Ghana

Year
FAO National
DIRTS survey

Maize Yields in Ghana
Maize Yields in Ghana

Year
FAO National DIRTS survey
FAO HybridMaize version 2013.4.1

kg/acre
0 1000 2000 3000 4000

1960 1980 2000 2020

How can we increase agricultural productivity in northern Ghana?

• Many possible barriers:
  • Previous findings: Using insurance to reduce farmers’ risk frees them up to invest more in inputs
  • Capital constraints?
  • Knowledge of best practices?
  • Timely access to inputs?
  • Information on output prices; weather forecasts?
DIRTS Key Findings

- Community Extension Agents improve knowledge and practice by 3% to 50% depending on the practice.
  - Timing of the message matters
- Adoption of improved practices by some farmers did not translate into measurable increases in average yields or profits for the group as a whole.
DIRTS Key Findings

INFORMATION

• Farmers adjust timing of planting and agrochemical application in response to text messages of 48-hour weather forecasts

• Text messages regarding current prices of grains at major markets influence decisions regarding storage
DIRTS Key Findings

RISK

• There is limited demand for rainfall index insurance
• But farmers granted substantial amounts of rainfall index insurance invest more heavily in agrochemical use
DIRTS Key Findings

INPUT MARKETS

- Free delivery and community marketing did not increase demand for inputs.
- Demand was driven by expectations given the availability, timing, and value of subsidies for inputs.
Ideal vs Actual Yields

by variety

Sika-aburo

Mamaba

Obaatanpa

Adikanfo

Tons / ha

2015 trials

2016 farmers fields

ideal vs actual yields by variety
4 years, 9 districts, 162 communities, 3178 households
The DIRTS sample by gender and education.

The DIRTS sample by district and gender of the respondent.
Household wealth

Crop shares of output by value
Distribution of cultivated area by gender

- Central Gwia
- Karaga
- Men
- Saboia
- Savelugu Nanton
- Tamale Norte
- Tonon Kumbungu
- Yendi
- Zabzugu Tatale

Bar chart showing the distribution of cultivated area by gender, with the number of acres indicated on the y-axis.
Topography and Crop Choice
Community Extension Agent (CEA) treatment

- One month residential training
- \( \approx 30 \) messages to be delivered, weekly, to 10 farmers; videos on tablets, managed by farmer history and current activities
- 2014 Initial focus on maize
  - 2015 Extended to legumes and female farmers
  - 2016 Meetings opened to others in community
CEA treatment

- One month residential training
- ≈ 30 messages to be delivered, weekly, to 10 farmers; videos on tablets, managed by farmer history and current activities
- 2014 Initial focus on maize
  2015 Extended to legumes and female farmers
  2016 Meetings opened to others in community
- Feedback – approximately 12,000 questions/year
- 75% of treatment farmers said the CEA made a “very” or “extremely positive effect” on their lives.
- 98% of treatment farmers agreed with the statement “Meeting with a CEA has led me to change some part of my farming practices.”
Insurance treatment

- *Faarigu* rainfall index insurance; developed with GAIP; drought only
- Marketing within communities by CBM open to all
- Introductory grants of $\approx 15$ of insurance to treatment
- “Heavy” insurance comparable to earlier study
Input marketing treatment

- Network of 10 input dealers and 60 Community Marketing Agents
- Catalogue available immediately at harvest
- Shipment to community provided

- Subsidy program
- 2014, 2015 FS
Forecast treatment

- Ignitia forecasts
- 2 day ahead via text early AM
- 2015, 2016 FS
Market Price Information treatment

- Esoko price information
- 2015, 2016 FS
- Output prices at 6 northern markets
Overview of Preliminary Results

*Note: These results are preliminary and may change after further analysis*
On average, the programs studied did not increase farmers’ output.
Households who got weather forecasts were more likely to plant in advance of rain

<table>
<thead>
<tr>
<th>Forecast of rain today</th>
<th>Forecast of rain tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>Control</td>
</tr>
<tr>
<td>1.59</td>
<td>1.46</td>
</tr>
<tr>
<td>1.13</td>
<td>1.08</td>
</tr>
</tbody>
</table>

Probability of Planting Today

Legend: Treatment / Control
Information spreads quickly—their neighbors were also more likely

<table>
<thead>
<tr>
<th>Forecast of rain today</th>
<th>Forecast of rain tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of Planting Today</td>
<td>Probability of Planting Today</td>
</tr>
<tr>
<td>Treatment</td>
<td>Neighbors</td>
</tr>
<tr>
<td>1.59</td>
<td>1.54</td>
</tr>
</tbody>
</table>

- Forecast of rain today
  - Treatment: 1.59
  - Neighbors: 1.54
  - Control: 1.13

- Forecast of rain tomorrow
  - Treatment: 1.46
  - Neighbors: 1.56
  - Control: 1.08
Market Price Information changed how farmers stored crops

Number of Bags Stored at Endline

<table>
<thead>
<tr>
<th></th>
<th>Maize</th>
<th>Groundnut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Treatment</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Control  
Treatment
Conclusions and Policy Lessons

• Community Extension Agents increase farmer knowledge and improve farmer practices
  • Appropriate timing of message delivery matters
  • Technology can be harnessed to leverage human resources

• Adoption of improved practices by some farmers did not generate an increase in average yields or profits the full group of farmers
Conclusions and Policy Lessons

• There is limited demand for rainfall index insurance

• Free delivery and community marketing did not increase demand for inputs

• Farmers adjust timing of planting and agrochemical application in response to text messages of 48-hour weather forecasts

• Text messages regarding current prices at major markets influence decisions regarding storage
Conclusions and Policy Lessons

• Our seed comparison suggests that currently-available improved seeds can perform better than the most commonly used seeds

• An imported hybrid variety was the most profitable in these trials
# Collaboration and Funding

We gratefully acknowledge support from:

<table>
<thead>
<tr>
<th>DFID – ESRC</th>
<th>SARI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gates Foundation – ATAI</td>
<td>USAID - BASIS</td>
</tr>
<tr>
<td>IFAD – NRGPP</td>
<td>USAID - DIV</td>
</tr>
<tr>
<td>IFPRI</td>
<td>World Bank – GIL</td>
</tr>
<tr>
<td>MoFA</td>
<td>Yale University</td>
</tr>
<tr>
<td>Northwestern University</td>
<td></td>
</tr>
</tbody>
</table>
Citations

- With Mathias Fosu, Markus Goldstein, Alev Gurbuz, Dean Karlan, Shashidhara Kolavalli
- Thanks to Federica DiBattista, John Branch, Jeffrey Mosenkis
Thank you