

Communicating with Farmers through Social Networks

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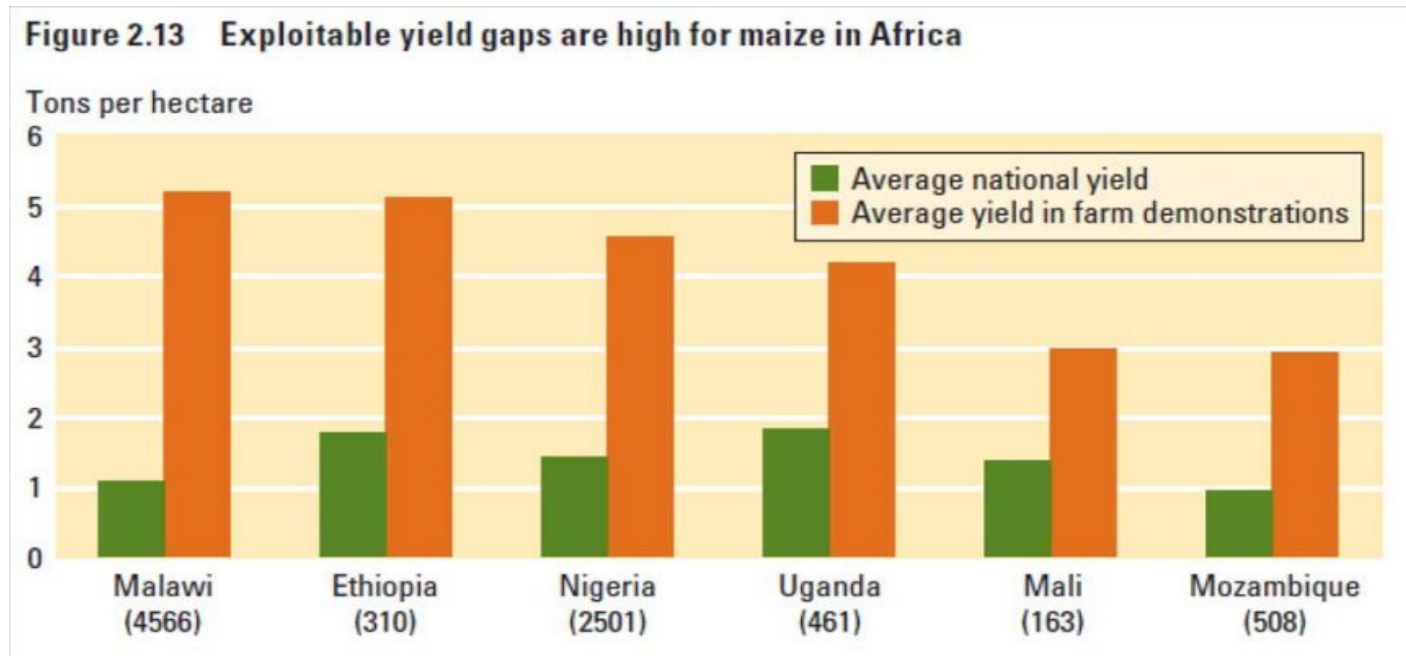
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Motivation

- Adoption of key ag technologies remains low in many African countries, despite demonstrated large gains



Reproduced from Udry (2010)

Motivation

- Adoption of key ag technologies remains low in many African countries, despite demonstrated large gains
 - Two Conservation Farming Technologies:
 - Pit planting in southern Africa: returns of 50-100% in 1st year (Haggblade and Tembo 2003)
 - Compost application also has substantial returns for maize production (Nyirongo et al 1999)
 - Limited adoption:
 - In our Malawi sample, baseline PP adoption = 1%
 - Baseline composting adoption = 19%
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Technologies



Pit Planting
Photo credit: August Basson



Composting
Photo credit: Mike Burns

Why Don't People Adopt?

- Liquidity constraints (credit market failure)
 - Risk Aversion (insurance market failure)
 - Information failures
 - Do rural farmers know about the technology?
 - Do they believe the official message about the benefits of the new technology? Are they convinced to adopt?
 - Policy Response?
 - Extension workers
 - ...but large literatures in economics and sociology suggest that *social networks* are the most persuasive sources of information
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Extension Services

- Public Departments of Agricultural Extension ubiquitous all over the developing world

Developing region	Total public extension personnel ('000)
Latin America	28
Middle East–North Africa	34
Asia	277
Sub-Saharan Africa	57
Total developing countries	396

- Extension workers often lack technical knowledge, farming skills, and communication abilities (Anderson and Feder 2007)
 - In our sample, 56% of ag extension officer (AEDO) positions staffed, average of 2455 hh/AEDO
 - In staffed areas, only 32% of households visited by AEDO
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Literature on Social Learning

- Economists, sociologists have long recognized the importance of social learning in agriculture (Griliches 1957, Rogers 1962),
 - and in many other technologies and behaviors (health, employment,..)
 - Strong social network effects on technology adoption in India, Mozambique, Ghana [Foster and Rosenzweig 1995, Munshi 2004, Conley and Udry 2010]
 - When do farmers decide to incorporate neighbors' experiences?
 - The models assume an automatic seamless transmission of knowledge from one network member to another
 - Each farmer observes “trials” of neighbors, and automatically learns
 - Duflo, Kremer and Robinson (2010) report the absence of social network effects in Kenya
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Contributions of our Project

- Policy+Academic:
 - We try to get inside the black box of the information transmission process with a large-scale field experiment.
 - With learning externalities, when and why does information get shared?
 - Does teaching effort matter? Do teachers need to be incentivized?
 - Who should you incentivize? People with a comparative advantage in communication? Highest stature or most representative?
 - Policy:
 - Can extension services be improved cost-effectively by incorporating social networks? How, exactly?
 - To make use optimal use of social networks, we need to understand who teaches, who learns, and how.
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Project Description

- Randomized controlled trial marketing two new agricultural technologies in 168 villages in Malawi
- Two complementary projects:

Extension Partner	Project 1	Project 2
Extension worker	Y	
Partner farmers	Worker-selected ("Lead farmers")	
	Focus group-selected ("Peer farmers")	Simple Contagion Complex Contagion
Control	Y	Y

Research Design for Project 1

Dissemination:	Extension agent		Lead Farmer		Peer Farmer		Control
Incentive:	Large	Small	Large	Small	Large	Small	
Technology	Incentive	Incentive	Incentive	Incentive	Incentive	Incentive	
Fertilizer Management	Either Male or Female (natural variation)		Male		Vary Male/Female composition of the set of Peer Farmers		
Conservation Agriculture			Female				
			Male				
			Female				

Induced (random) variation:

- Three types of communication strategy
- Small incentive provided to communicators (or not)
- Varied gender of communicator
- (plus two types of technologies)

Communicator comparisons

Dimension	AEDO	Lead Farmer	Peer Farmer
Technical knowledge	++	+	o
Existing social links	o	+	+
Comparability of inputs / assets to target farmers	o	+	++

	Non-comm. households	LF		PF		Difference between		
		Actual	"Shadow"	Actual	"Shadow"	Non-comm. & LFs	Non-comm. & PFs	PFs & LFs
Household has grass roof	79.1%	64.0%	67.6%	73.6%	75.6%	12.63% ^{***}	4.18% ^{**}	8.45% ^{**}
Respondent education > year 5	45.6%	76.3%	64.3%	54.5%	55.8%	-22.8% ^{***}	-9.1% ^{***}	-13.1% ^{***}
Household size	4.6	5.489	5.548	5.174	5.153	-0.93 ^{***}	-0.60 ^{***}	-0.37 [*]
	[2.123]	[2.376]	[2.149]	[2.145]	[1.974]			
Respondent age	41.5	41.2	42.2	40.2	41.4	-0.4	0.5	-0.9
	[16.8]	[14.1]	[13.3]	[14.2]	[14]			

Links & Perceptions of Communicators

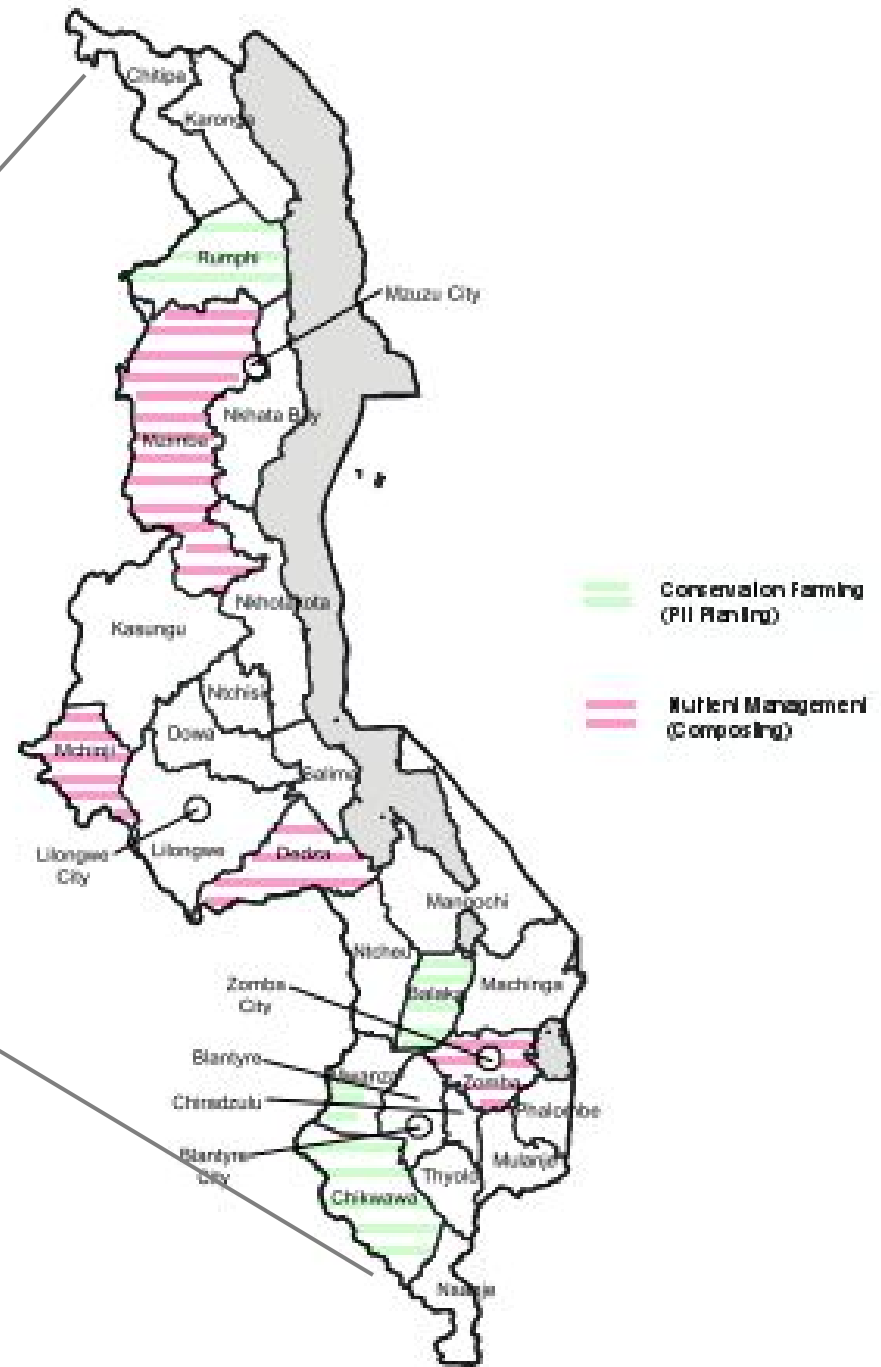
Communicator	LF	PF (mean)	LF - PF (mean)
Related to respondent	0.514	0.466	0.048
Immediate family of respondent	0.131	0.107	0.024
Talk daily with respondent	0.217	0.189	0.027
Group together with respondent	0.177	0.147	0.030
Communicator uses same or fewer inputs than respondent	0.285	0.383	-0.098
Communicator's farm is same or smaller than respondent	0.331	0.447	-0.117
Honesty rating [1-4]*	3.58	3.35	0.23
Agricultural knowledge rating [1-4]*	3.41	3.05	0.36

* Measured at midline (sample includes only control villages)

Incentives

- Based on performance
 - Year 1:
 - 20 pp increase in average knowledge score among village respondents
 - Year 2:
 - 20 pp increase in adoption rate in village
 - Equal total value per village (~80)
 - AEDOs: Bicycle
 - LF: Fertilizer
 - PF: Legume seeds
 - Can have both positive and negative effects
 - Enhance effort
 - Undermine credibility
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4200 randomly sampled households in 168 villages across 8 districts in Malawi



Results: Incentives matter

- Year 1 outcome: target farmers' knowledge scores
- Year 2 outcome: Adoption, Agricultural Profits
- Without incentives, knowledge of new technologies among target farmers in PF villages are not statistically distinguishable from pure control villages where we never introduced the technology at all.

Communicator Type	Gain in Knowledge When Communicator <i>Not</i> Offered Rewards	Gain in Knowledge When Communicator Offered Rewards
AEDO	0.17 [0.07 – 0.25]	0.05 [0 – 0.1]***
Lead Farmer	0.08 [0.02 - 0.14]	0.07 [0.02 – 0.12]
Peer Farmer	0.03 [-0.01 - 0.07]	0.12 [0.06 - 0.18]***

Why?

- Without incentives, the assigned communicators themselves do not retain any knowledge about the technology
- People only learn if their communicators retain information

Communicator Knowledge (relative to shadow communicators)		
	Without Incentives	With Incentives
Lead Farmer	0.04	0.09*
Peer Farmer	0.02	0.16***

Why?

- Communicators put in more effort when incentivized
- Respondents rate PFs as more knowledgeable about agriculture in incentive villages

Participated in communicator-led activity

AEDO treatment	0.142*** (0.0593)
LF treatment	0.0515 (0.0801)
Incentives x AEDO	0.0693 (0.0575)
Incentives x LF	0.149*** (0.0785)
Incentives x PF	0.283*** (0.0694)
Observations	2,962

Social relationships change, interactions increase, with incentives

VARIABLES	(3)	(4)	(5)	(6)
	Talk to communicator Non-incentive	Talk to communicator Incentive	Communicator walks by house Non-incentive	Communicator walks by house Incentive
AEDO treatment	0.234*** (0.0723)	0.285*** (0.0526)	0.0577 (0.0760)	0.117*** (0.0513)
LF treatment	0.176*** (0.0458)	0.226*** (0.0394)	0.00868 (0.0505)	0.0743 (0.0454)
PF treatment	0.117*** (0.0495)	0.339*** (0.0449)	0.0627 (0.0497)	0.139*** (0.0504)
Observations	2,109	2,222	2,109	2,222

Incentives to communicators improves others' perceptions about them

	Honesty				Agricultural Knowledge			
	LF		PF		LF		PF	
Incentives	0.0624 (0.0926)	-0.0266 (0.0745)	0.225*** (0.0819)	0.177*** (0.0619)	0.142 (0.119)	0.0271 (0.104)	0.309*** (0.0951)	0.210*** (0.0733)
Rating of PF honesty (mean)		0.582*** (0.0644)				0.604*** (0.0657)		
Rating of LF honesty				0.629*** (0.0339)				0.623*** (0.0300)
Observations	853	834	745	687	812	783	724	663
R-squared	0.018	0.346	0.025	0.412	0.025	0.354	0.037	0.441

Who responds to incentives?

- Poor peer farmers appear to respond most strongly to incentives
- Female peer farmers respond to incentives more strongly than males

Communicator Type	No incentive	Incentive
AEDO	0.17	0.06
Poor Lead Farmer	0.08	0.04
Non-poor Lead Farmer	0.07	0.09
Poor Peer Farmers	-0.01	0.08
Non-Poor Peer Farmers	0.17	0.20

- Teacher quality and effort may matter?
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Knowledge predicts actual adoption

	Use Technology (Observed in OFM)			
	(1)	(2)	(3)	(4)
Score on Knowledge of Relevant Technology, 0-1, All Included	0.325*** (0.0737)	0.286*** (0.0673)	0.268*** (0.0638)	0.277*** (0.0709)
Treatment village			0.240*** (0.0818)	0.00360 (0.0415)
Incentive treatment				0.216*** (0.0465)
CF District	-0.563*** (0.0577)	-0.512*** (0.0567)	-0.505*** (0.0506)	-0.499*** (0.0460)
Observations	718	861	858	861

Marginal effects are shown. Standard errors in parentheses, clustered by village

* p<0.1, ** p<0.05, *** p<0.01

Actual Adoption 2 years later – Non-incentive villages

	(1)	(2)	(3)	(5)	(6)	(7)
	Heard of PP	Know enough PP	Heard of NM	Used PP	Used PP - OFM	Used NM
AEDO treatment	0.216*** (0.0462)	0.189*** (0.0442)	-0.0916 (0.0678)	0.0429*** (0.0174)	0.0336 (0.0214)	-0.0946*** (0.0446)
LF treatment	0.0643 (0.0577)	0.0439 (0.0415)	0.131*** (0.0655)	0.0110 (0.00794)	0.0628*** (0.0349)	0.0406 (0.0521)
PF treatment	0.0372 (0.0508)	0.0387 (0.0403)	0.0536 (0.0596)	0.0193*** (0.0115)	0.0280 (0.0484)	-0.0475 (0.0447)
Constant	0.254*** (0.0262)	0.111*** (0.0213)	0.456*** (0.0511)	0.00712*** (0.00288)	0.0220 (0.0214)	0.195*** (0.0342)
Observations	1,516	1,516	1,367	1,516	208	1,367
R-squared	0.023	0.028	0.017	0.011	0.015	0.011
F-test1 AEDO = LF	5.660	7.598	13.49	2.914	1.123	7.732
Prob>F1	0.0210	0.00799	0.000559	0.0937	0.309	0.00749
F-test2 AEDO = PF	9.620	8.466	7.217	1.327	0.0163	1.346
Prob>F2	0.00308	0.00528	0.00962	0.254	0.900	0.251

Actual Adoption 2 years later – Incentive villages

	(1)	(2)	(3)	(5)	(6)	(7)
	Heard of PP	Know enough PP	Heard of NM	Used PP	Used PP - OFM	Used NM
AEDO treatment	0.0873*** (0.0311)	0.0593*** (0.0353)	0.251*** (0.0761)	-0.00144 (0.00605)	0.0307 (0.0310)	0.218*** (0.0935)
LF treatment	0.0994*** (0.0465)	0.111*** (0.0407)	0.191*** (0.0695)	0.0321*** (0.0150)	0.0276 (0.0383)	0.150*** (0.0654)
PF treatment	0.268*** (0.0426)	0.264*** (0.0396)	0.285*** (0.0654)	0.0940*** (0.0221)	0.0950*** (0.0395)	0.273*** (0.0741)
Constant	0.254*** (0.0262)	0.111*** (0.0213)	0.456*** (0.0511)	0.00712*** (0.00288)	0.0220 (0.0209)	0.195*** (0.0342)
Observations	1,619	1,619	1,393	1,619	344	1,393
R-squared	0.052	0.071	0.057	0.043	0.023	0.052
F-test1 AEDO = LF	0.0824	1.347	0.656	4.606	0.00598	0.436
Prob>F1	0.775	0.251	0.422	0.0363	0.939	0.512
F-test2 AEDO = PF	23.23	21.96	0.240	17.97	2.528	0.250
Prob>F2	1.17e-05	1.87e-05	0.626	8.63e-05	0.125	0.619

Conclusions

(preliminary)

- Information transmission is not automatic, especially about entirely new technologies. Incentives matter.
 - Learning externalities create a role for an external agent to intervene in the process of learning.
 - Can improve extension by incorporating social networks.
 - People learn more from “comparable” trials
 - Both teacher quality and effort matter.
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Extra slides

Insufficient information?

- Baseline awareness: PP 25%, Compost 54%
- Baseline technical knowledge lacking:

Knows correct depth of PP (+/-25%)	0.005 (0.064)
Knows correct width of PP (+/-25%)	0.005 (0.064)
Knows correct length of PP (+/-25%)	0.005 (0.064)
Knows correct number of seeds for PP	0.038 (0.19)
Knows correct quantity of manure for PP	0.009 (0.094)
Knows how to use maize stovers for PP	0.045 (0.206)

Social networks literature

- Social learning in other contexts:
 - Job information: Beaman (2009), Magruder (2009)
 - Deworming: Miguel and Kremer (2007)
 - Health behaviours: Godlonton and Thornton (2009), Oster and Thornton (2009)
 - Social promoters and incentives:
 - Kremer et al (2009), Ashraf, Bandiera, and Jack (2011)
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Sample

- 4200 randomly sampled households in 168 villages across 8 districts in Malawi
 - Communication treatment assignments:
 - AEDO: 25 villages
 - LF: 50 villages
 - PF: 45 villages
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