The role of social connections and community context in adaptive farming practices among Sri Lankan households

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Key Findings

- Climate-adaptive farming practices are underutilized in Sri Lanka.
- Male head farmers have similar *awareness* of adaptive practices, regardless of level of social connection.
- There are clear disparities in access to information – female farmers are less *aware* of adaptive practices.
- Social connectedness measures are important individual- and village-level predictors of adoption of adaptive farming practices.
- Village-level context matters for adoption of drought-adaptive farming practices.

Abstract

Climate change is pressuring dynamics in coupled natural and human systems, necessitating human adaptation. Adaptation in complex, multi-scalar systems requires collaborative approaches. Understanding how actors collaborate and exchange knowledge is of considerable importance for predicting adaptive responses and identifying opportunities for interventions. Data for this analysis come from the Sri Lankan Environmental and Agricultural Decisionmaking Survey (SEADS) – a survey of 1,148 smallholder paddy-farming households in Sri Lanka's heavily agricultural "dry zone". Using a multi-level mixed regression model approach, we examine the relationship between a farmer's *awareness* and *adoption* of drought adaptation strategies (e.g., seed selection, irrigation management, harvest timing) and level of social connectedness (e.g., participation in farmer organizations, trust in social support assistance in an emergency, perception of village social cohesion), controlling for other demographic and economic variables. Results indicate some measures of social connectedness are positively associated with awareness and adoption of adaptive farming practices.

Background

Droughts are one of the most costly natural disasters worldwide, both socially and economically¹. Changing climatic conditions are making droughts worse in many regions, increasing their prevalence, extent, intensity and duration². The effects of droughts are especially severe in agricultural and food systems where livelihood outcomes are tightly linked to meteorological conditions³.

Farmers facing intensifying drought conditions will need to adapt their behaviors to continue farming.

Addressing food insecurity and malnutrition in Sri Lanka remains a major challenge⁴.

Legend Survey Sites Centrally managed Locally managed Rainfall zones Dry zone Intermediate zone 0 15 30 60 Kilomet



References

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Acknowledgements

We thank our collaborators at Vanderbilt University, the University of North Florida, and Sri Lanka's National Building Research Organisation and the National Science Foundation Water, Sustainability and Climate Program for their support (NSF-EAR 1204685):An Investigation of Vulnerabilities and Responses to Water Stress Among Paddy Farmers in Sri Lanka. We also thank the Institute of Behavioral Science (IBS) and the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado Boulder for their ongoing graduate student support and professional development.



Agriculture accounts for nearly 45% of land use in Sri Lanka. Farmers there are facing increasing drought conditions in many regions⁵. Given the limited land resources, agricultural land expansion is problematic. To address food insecurity and malnutrition concerns, farmers there will need to intensify their agricultural production. Previous work there suggests **social capital is an important driver of adaptive responses**.

Drought and Farming Practices in Sri Lanka



⁶ Gunda, T., Hornberger, G. M., & Gilligan, J. M. (2016). Spatiotemporal patterns of agricultural drought in Sri Lanka: 1881–2010. *International Journal of*

METHODOLOGY





Sample

Randomly selected dry zone villages (24) Compiled from voting records and farmer orgs Rice farming households randomly selected Fully random probability sampling frame

	Mean (SD)/%				
Male	81%				
Age	50.9 (11.9)				
Paddy land (acres)	3.55 (3.32)				
Tamil (vs. Sinhalese)	27.6%				
Off farm income	53.0%				
<i>Note.</i> N=1,011 paddy farmers in 24 villages					

Analytic Approach – multi-level regression modeling, numerous control variables in "simple" models, key predictor variables added to "complex models"

RESULTS: Multi-level Modeling - Awareness and Adopted/Practiced

VARIABLES		Model A (simple)		Model B c	omple
CONTROLS		coeff.	signif.	coeff.	sign
Gender (ref = male)					
	Male (vill.)	-2.23		-1.78	
	Male (indiv.)	0.34	**	0.33	**
Age (ref = <40)					
Age 40-60	Age 40-60 (vill.)	0.88		1.95	
	Age 40-60 (indiv.)	0.03		0.02	
Older than 60	Age >60 (vill.)	4.85		6.62	+
	Age >60 (indiv.)	0.07		0.05	
Education (ref = Grade 1-5)					
Grade 6-11	Secondary Ed. (vill.)	2.76		3.67	+
	Secondary Ed. (indiv.)	0.12		0.12	
Grade 12+	Ed. >12th Grade (vill.)	1.96		1.85	
	Ed. >12th Grade (indiv.)	0.16	+	0.16	+
Off-farm income					
	Income Off Farm (vill.)	-3.64		-3.11	
	Income Off Farm (indiv.)	0.06		0.06	
Socioeconomic					
Wealth	SES (vill.)	-0.56		-0.56	
	SES (indiv.)	0.08	•	0.07	•
Ethnicity (ref = Sinhalese)					
	Tamil (vill.)	-1.46		-1.11	
	Tamil (indiv.)	0.00		0.00	
Farming Occupation					
	Farmer Occup. (vill.)	-1.27		0.02	
	Farmer Occup. (indiv.)	0.14	+	0.14	+
Agroecological					
PaddyLand	Paddyland Acres (vill.)	0.23		0.17	
	Paddyland Acres (vill.)	0.02	+	0.02	+
Irrigation	Paddy % Irrig (vill.)	0.69		0.58	
	Paddy % Irrig (indiv.)	-0.18		-0.17	
KEY PREDICTORS					
Social Connectedness					
Far	mer Org. Partichigh (vill.)			0.62	
Farm	Farmer Org. Partichigh (indiv.)			0.04	
	Village Cohesion (vill.)			-0.88	
	Village Cohesion (indiv.)			0.00	
S	ocial Support Expect. (vill.)			1.23	
So	cial Support Expect. (indiv.)			-0.06	
Constant	_cons	7.98	+	5.64	
RANDOM EFFECTS					
Village	cons	0.35		0.32	
	residual	0,97		0.97	
N		1.011		1.011	
		_,		2,022	

AWARENESS MODELS added (complex) level (vill.) variables

• Droughts increasing in Sri Lanka, early work indicated farmers were aware of *some* drought-adaptive practices...but were not utilizing them. Why?



Research Questions



RESULTS: Drought-Adaptive Farming Practices

Survey Questions:

Have you heard about...[insert adaptive practice]?

Have you practiced...[insert adaptive practice]?

Dependent Variables (from survey questions):

RQ1: Awareness of the adaptive practices. RQ2: Adoption of the adaptive practices.

List of Adaptive Practices:

- Traditional Bethma (BTH)
- Water-Conserving Irrigation using recycled irrigation water (RIW), setting water height lower than the weir (LH), using PVC to set flood depth (PVC), alternate wetting-drying irrigation (AWD)
- Planting Kakula / Kakulama (KL), transplanting seedlings (TS), parachute method (PCH)
- Crop Selection_— alternate lowland field crops (OFC), using short-duration seed varietals (SDS)

(A) The proportion of Sri Lankan head farmers who have heard about (*awareness*) the drought-adapted farming practices. Farmer responses come from the Sri Lankan Environmental and Agricultural Decision-Making Survey (2015-2017). Responses were coded as No/Yes (0/1). (B) The proportion of Sri Lankan head farmers who practiced (adoption or uptake) the droughtadapted farming practices in the last growing season.

- Two model runs, one with control variables only (simple), one with key predictor variables
- Models include individual- (indiv.) and village-
- Significant variables: male (indiv.), SES (indiv.) • Social Connectedness variables non-significant

PRACTICED / ADOPTED MODELS

• Two model runs, one with control variables only (simple), one with key predictor variables added (complex Models include individual- (indiv.) and village

level (vill.) variables • Significant variables: male (vill.), ages over 40(indiv.), off-farm income (vill.), paddyland acres (vill.), awareness about the practices (vill. Some signif. Social Connectedness variables

VARIABLES		Model C (simple)		Model D (comp	
CONTROLS		coeff.	signif.	coeff.	signi
Gender (ref = male)					
	Male (vill.)	3.67	•	3.53	*
	Male (indiv.)	0.23	+	0.22	
Age (ref = <40)					
Age 40-60	Age 40-60 (vill.)	0.10		-0.17	
	Age 40-60 (indiv.)	0.20	•	0.21	*
Older than 60	Age >60 (vill.)	-2.12		-0.18	
	Age >60 (indiv.)	0.41	***	0.44	***
Education (ref = Grade 1-5)					
Grade 6-11	Secondary Ed. (vill.)	2.04	+	2.84	•
	Secondary Ed. (indiv.)	0.15		0.15	
Grade 12+	Ed. >12th Grade (vill.)	-1.13		-1.05	
	Ed. >12th Grade (indiv.)	-0.03		-0.03	
Off-farm income					
	Income Off Farm (vill.)	5.11	•	5.62	***
	Income Off Farm (indiv.)	-0.07		-0.07	
Socioeconomic	income en runn (inchi)	0.07		0.07	
Wealth	SES (vill.)	-0.31		-0.39	
Weatth	SES (indiv.)	0.02		0.01	
Ethnicity (ref = Sinhalese)	525 (mart.)	0.02		0.01	
Edinicity (ref = Shinalese)	Tamil (vill)	0.82		1 16	
	Tamil (indiv.)	0.02		0.00	
Earming Occupation	ranni (morv.)	0.00		0.00	
Farming Occupation	Earmar Occup (vill)	0.07		1.02	
	Farmer Occup. (indiv.)	-0.07		1.02	
Agroscological	Farmer Occup. (Indiv.)	0.00		0.01	
Agroecological	Dadddand Acros (vill)	0.01		0.05	
FaddyLand	Paddyland Acres (vill.)	-0.01		-0.05	
Irrigation	Paddyland Acres (vill.)	0.04		0.04	
Imgation	Paddy % Irrig (viii.)	0.50		0.62	+
VEV PREDICTORS	Paddy % Img (Indiv.)	0.05		0.06	
KET PREDICTORS					
Awareness or practices	August (1911)	0.65		0.54	
	Aware (vill.)	0.65		0.54	
	Aware (Indiv.)	0.31		0.31	
Control Company da la control					
Social Connectedness	and a Car Bastia bisk (sill)				
Fa	irmer Org. Particnign (vill.)			1.44	
Fari	ner Org. Partichigh (indiv.)			-0.07	
	Village Conesion (Vill.)			-0.89	
	Village Conesion (Indiv.)			0.16	-
	Social Support Expect. (vill.)			1.10	
S	ocial Support Expect. (Indiv.)			-0.03	
		0.00		40.07	
Constant	_cons	-9.23		-10.07	
RANDOW EFFECTS		0.10		0.00	
village	_cons	0.12		0.06	
	_residual	1.38		1.37	
		1 (111)		1.011	





Hybrid Variety N = 526 rice farmers in 12 dry-zone communities

To what extent does social connectedness correlate with **awareness of** adaptive farming practices?

To what extent does social connectedness correlate with **adoption of** adaptive farming practices?



CONCLUSIONS

- RQ1: Sri Lankan farmers are largely aware of and utilizing some of these drought—adapted farming practices, regardless of level of social connection...
- BUT...there are clear disparities in who has access to this information as women farmers are not as *aware* of and not *adopting* as many of the practices as males.
- RQ2: Some measures of social connectedness are important predictors of utilizing drought-adapted practices but the effect is variable (indiv. vs. vill.)