Migration, Climate, Livelihoods: Lessons from research in Mexico and South Africa

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Talk Outline

- Foundations
- Mexico: theory, data, methods
- South Africa: theory, data, methods
- What's needed next ?

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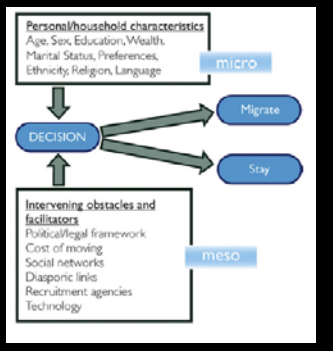
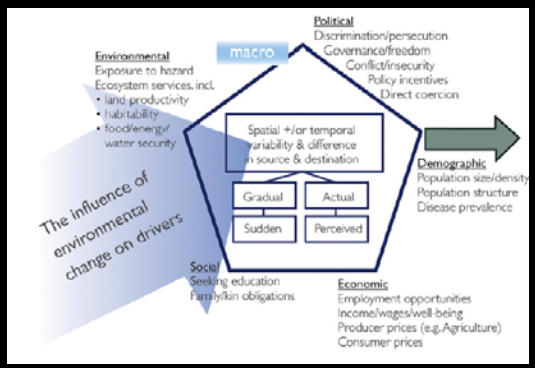
Migration as a core demographic process, what do we know?



Black et al. 2011



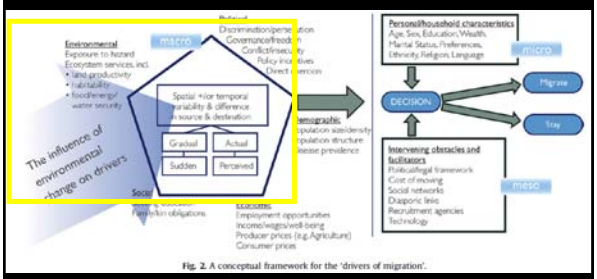


Fig. 2. A conceptual framework for the 'drivers of migration'.

Findings from Migration-Climate Research ….

- Environmental pressures come in myriad forms
- Environmental "push" factors intertwine with economic and other factors shaping vulnerability
  - East Africa: Bunce, Rosendo, Brown 2010
  - Nicauragua: Radel et al. 2017
- In rural households, migration is but one component of a variety of adaptive livelihood strategies
  - Ethiopia: Meze-Hausken 2000
  - Vietnam: Adger et al 2002
  - Canada: McLeman 2014
  - Brazil: Vanwey et al. 2007
  - China: Qin 2010
  - Nicaragua: Radel et al. 2017

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- In some regions, drier areas and those with recent rainfall deficits, exhibit higher levels of outmigration
  - Ethiopia: Henry et al. 2005
  - Mexico: Nawrotzki et al. 2012, Hunter et al. 2012

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- Much environmentally-induced migration is internal
  - Ecuador: Clark and Bilsborrow 2013
  - Guatemala: Lopez-Carr 2012
  - Nepal: Massey et al. 2010
  - China: Qin 2010
  - Cambodia: Nuorteva et al. 2010

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- In fact, international migration is sometimes associated with GREATER "natural capital"
  - Ecuador: Gray 2010, Gray and Bilsborrow 2013

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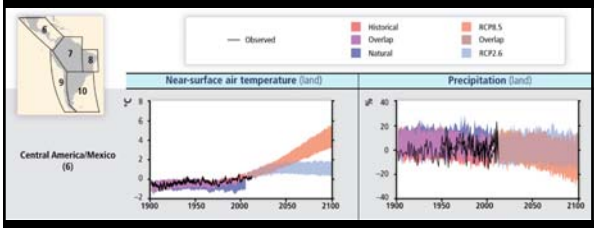
Why study environmental aspects of Mexican migration?

- As of 2013, substantial work on social, economic, political drivers
  - little on environmental
- Natural disasters, crop yields



Magrin, G.O., J.A. Marengo, J.-P. Boulanger, M.S. Buckeridge, E. Castellanos, G. Poveda, F.R. Scarano, and S. Vicuña, 2014: Central and South America. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1499-1566.

Environmental conditions important

- Agriculture key to rural Mexican livelihoods
- Majority rain-fed
- Theory: New Economics of Labor Migration

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Data

- Typical secondary sources for Mexico-US migration research
  - Mexican Migration Project
  - Mexican Census Public Use Microdata Sample, 2000 and 2010
  - IPUMS Terra

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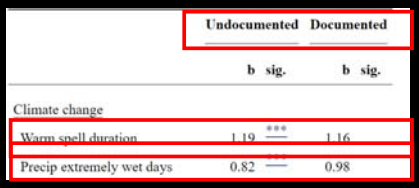
Methods

- Geocoding at municipal scale
- Rainfall data: Climate Research Unit, WorldClim
- Measurement:
  - Recent temp/rainfall compared to 30-year normal
  - Warm/cold spells, duration, intensity
- Multi-level data

Methods

- Survival analysis:
  - Probability of adult HH member emigrating to US
    - With socioeconomic controls + recent climate conditions

	Undocumented		Documented	
	b	sig.	b	sig.
Household level (head)				
Female	0.53	***	0.68	
Married	0.96		1.36	
No. of children	0.90	**	0.99	
Education [a]	0.74	**	3.29	***
Working experience [a]	0.71	***	1.00	
Occupation: not in labor force	0.91		1.45	
Occupation: white collar	0.50	***	0.63	
Owns property	0.83	*	1.14	
Owns business	0.77	*	1.03	
Community/municipality level				
Network density [a]	1.56	***	1.49	**
Wealth index	0.81		0.74	
Corn (area harvested)	0.94		0.68	*
Farmland irrigated [a]	1.04		0.93	
Base period precip (1961–90)	1.11		0.73	
Base period temp (1961–90)	0.91	**	0.98	
Male labor in agriculture [a]	1.01		0.88	
Climate change				
Warm spell duration	1.19	***	1.16	
Precip extremely wet days	0.82	***	0.98	



	Undocumented		Documented	
	b	sig.	b	sig.
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Overall findings

Most influence of environmental conditions on migration:

- Dry areas
- Rural (vs. urban), agriculturally-dependent
- International (vs. internal)
- Strong social networks
- Undocumented (vs. documented)
- With intersecting rain/temp extremes

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Environmental Context

Resource	Mean % of households
Wild spinaches	95.6 ± 1.3
Fuelwood	95.5 ± 1.9
Wooden utensils	95.1 ± 1.9
Grass hand-brushes	90.7 ± 4.6
Wild fruits	88.2 ± 4.0
Twig hand-brushes	87.1 ± 5.1
Wood for fences or kraals	62.0 ± 5.5
Weaving materials (reeds, grass, palm leaves)	55.4 ± 9.6
Edible insects	53.5 ± 9.5
Bushmeat	51.6 ± 8.4
Wild honey	50.5 ± 10.6
Medicinal plants	49.4 ± 7.5
Wood for housing poles	49.0 ± 8.1
Thatch grass	48.8 ± 9.0

Natural resource context important

- Theory: Sustainable Livelihoods Framework

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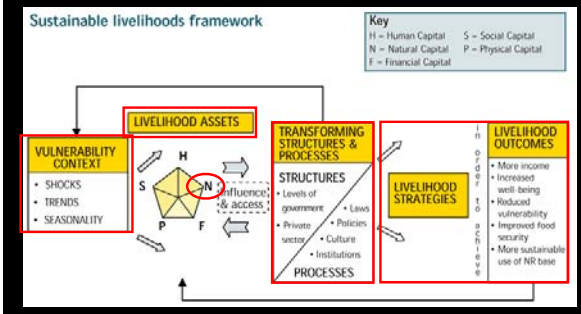
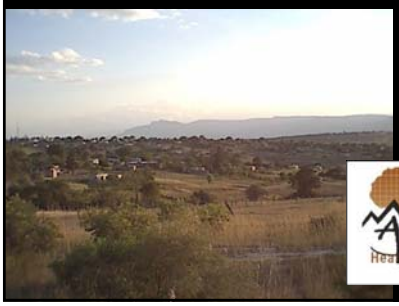


Data



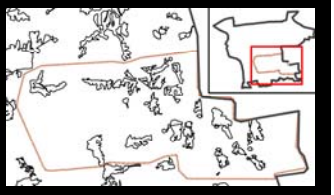
- Wits School of Public Health, Health and Population Division
- 21 villages
- 11,000 HHs
- Baseline: 1992

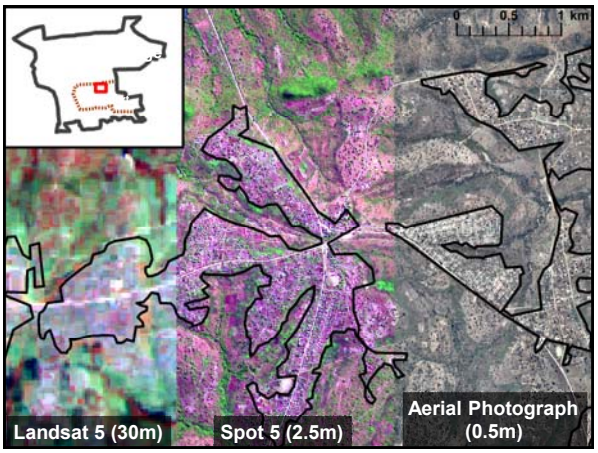
AgincourtHealth & Population Unit

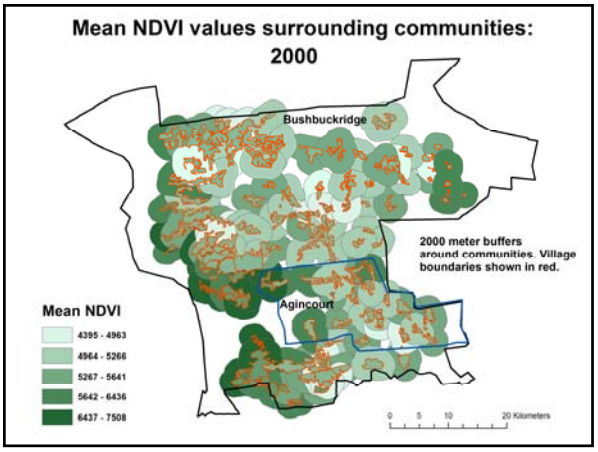
INDEPTH Network
Better Health Information for Better Health Policy

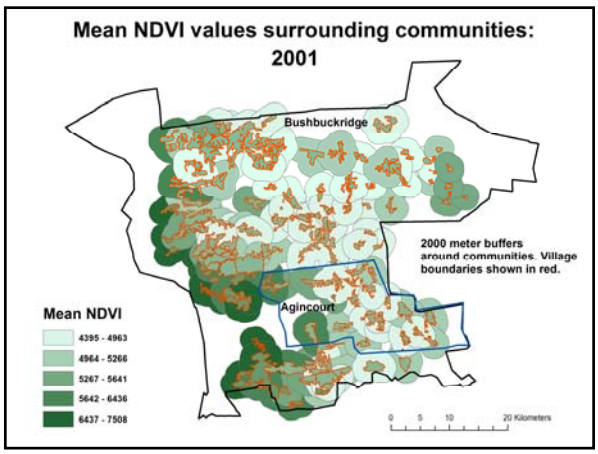
Data

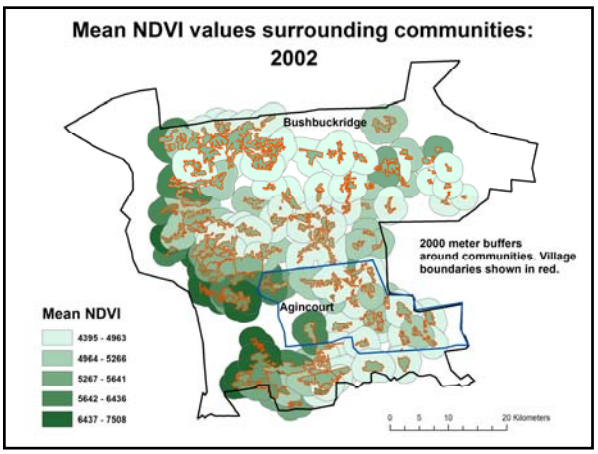
- Natural resource context important
- Remotely sensed imagery
  - NDVI

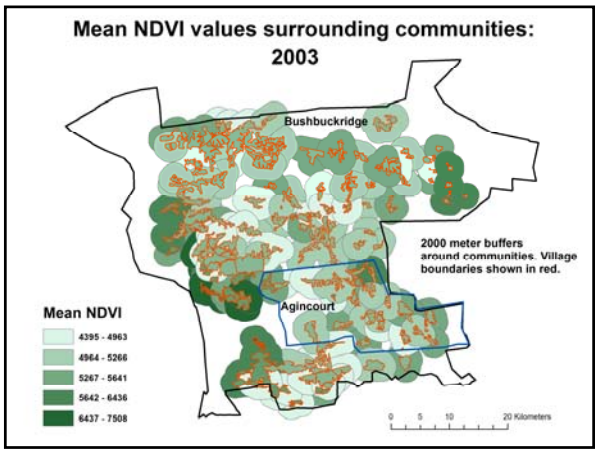


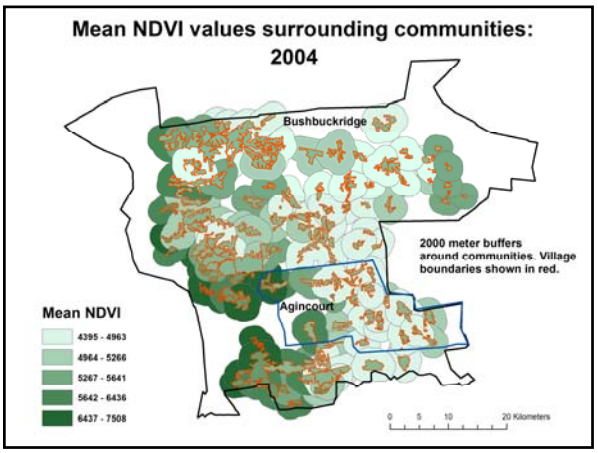









Mean NDVI values surrounding communities:
2003
Bushbuckridge
Agincourt
2000 meter buffers around communities. Village boundaries shown in red.
Mean NDVI
4395 - 4963
4964 - 5266
5267 - 5641
5642 - 6436
6437 - 7508
0 5 10 20 Kilometers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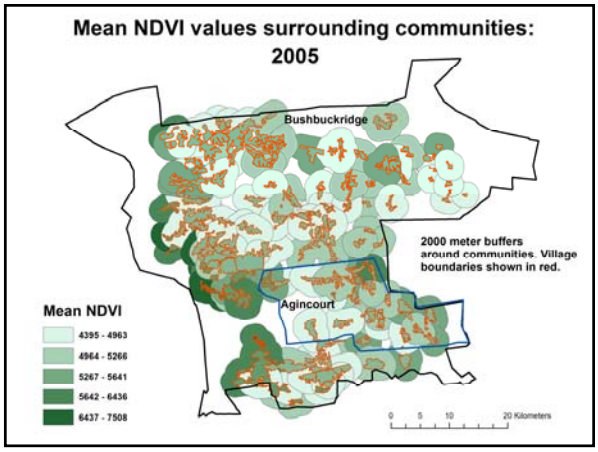
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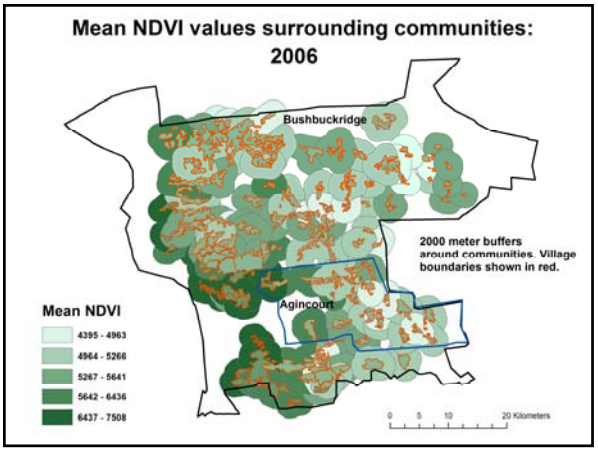
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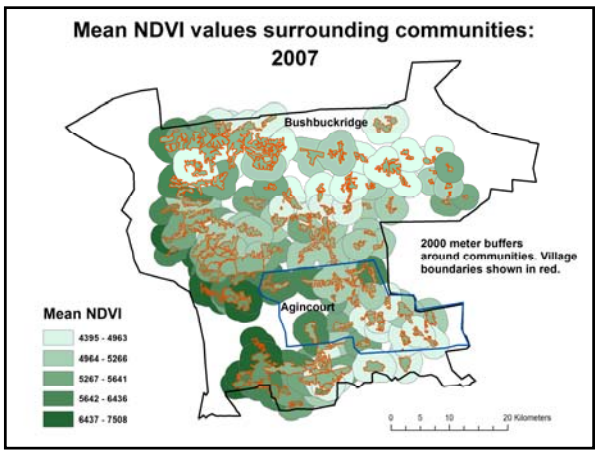
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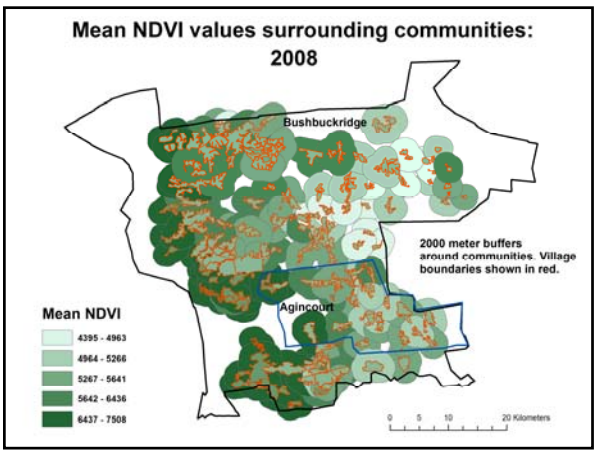
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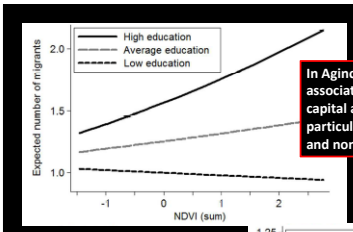
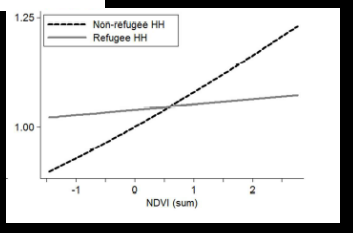


In Agincourt globally, the positive association between proximate natural capital and temporary outmigration is particularly strong for more educated and non-refugee households.



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- Expanded theoretical guidance
  - Migration theory
- Expanded modeling
  - Complex systems models (!)
    - ABMs

Will climate change shift demography's 'normal science'?

*Lori M. Hunter and Jane Menken**

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Agent-based modeling of environment-migration linkages: a review

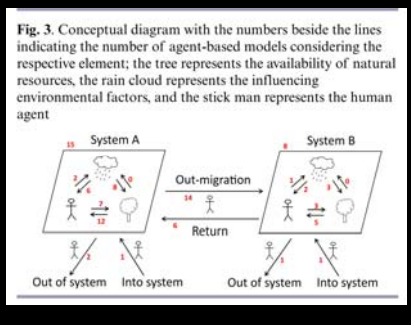

Fig. 3. Conceptual diagram with the numbers beside the lines indicating the number of agent-based models considering the respective element; the tree represents the availability of natural resources, the rain cloud represents the influencing environmental factors, and the stick man represents the human agent

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