Policies for Improved Food Security: Lessons from Farm Household Studies

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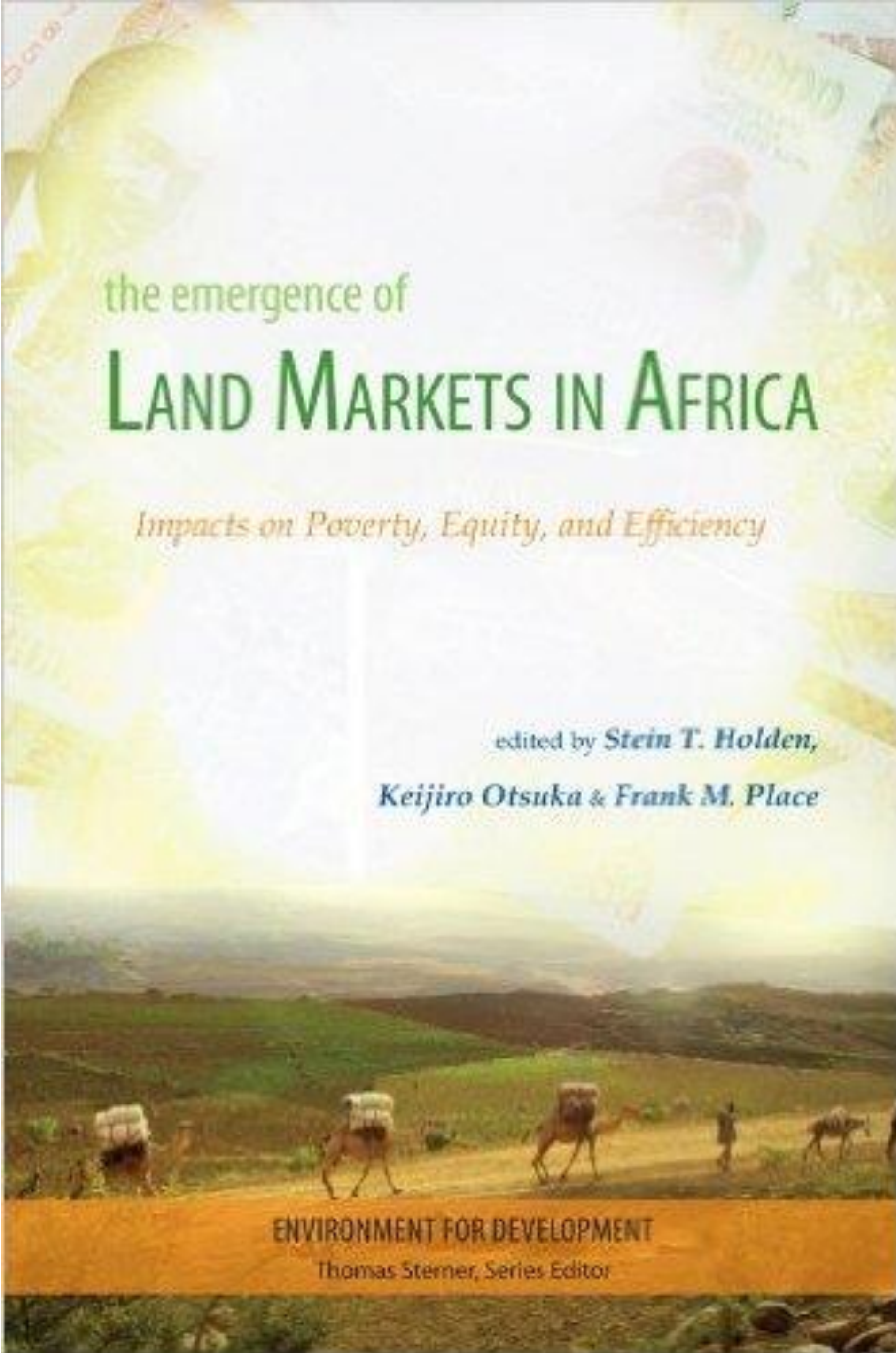
Lessons from Household Studies I: Land Tenure Policies & Land Markets

– Lessons from Holden, Otsuka & Place(2009); Holden, Otsuka and Deininger (2013), Holden & Otsuka (2014)++.

- **Emerging Land Markets in Africa**: Implications
- Past and Potential Future **Roles of Land Tenure Reforms and Land Markets in Sub-Saharan Africa**
- →The Need for Better Land Governance
- →The Importance of Tenure Security
- →The Link between Tenure Security and Food Security



NMBU

The first systematic attempt to address emerging land markets and their implications for poverty, equity, and efficiency across a number of African countries.

Revealed that land rental markets
- Are active in many African countries
- Also in customary tenure systems

The Emergence of Land Markets

- The fear that land sales markets will lead to landlessness and more unequal land distribution
  - Some but limited evidence
  - Prohibition and restrictions on land sales still common
- Land rental markets more common
  - Transfer land to more efficient producers
  - Transfer land to relatively land-poor households
  - More flexible adjustment of farm sizes with limited capital requirements – facilitate agricultural transformation
  - More can be done to enhance their efficiency

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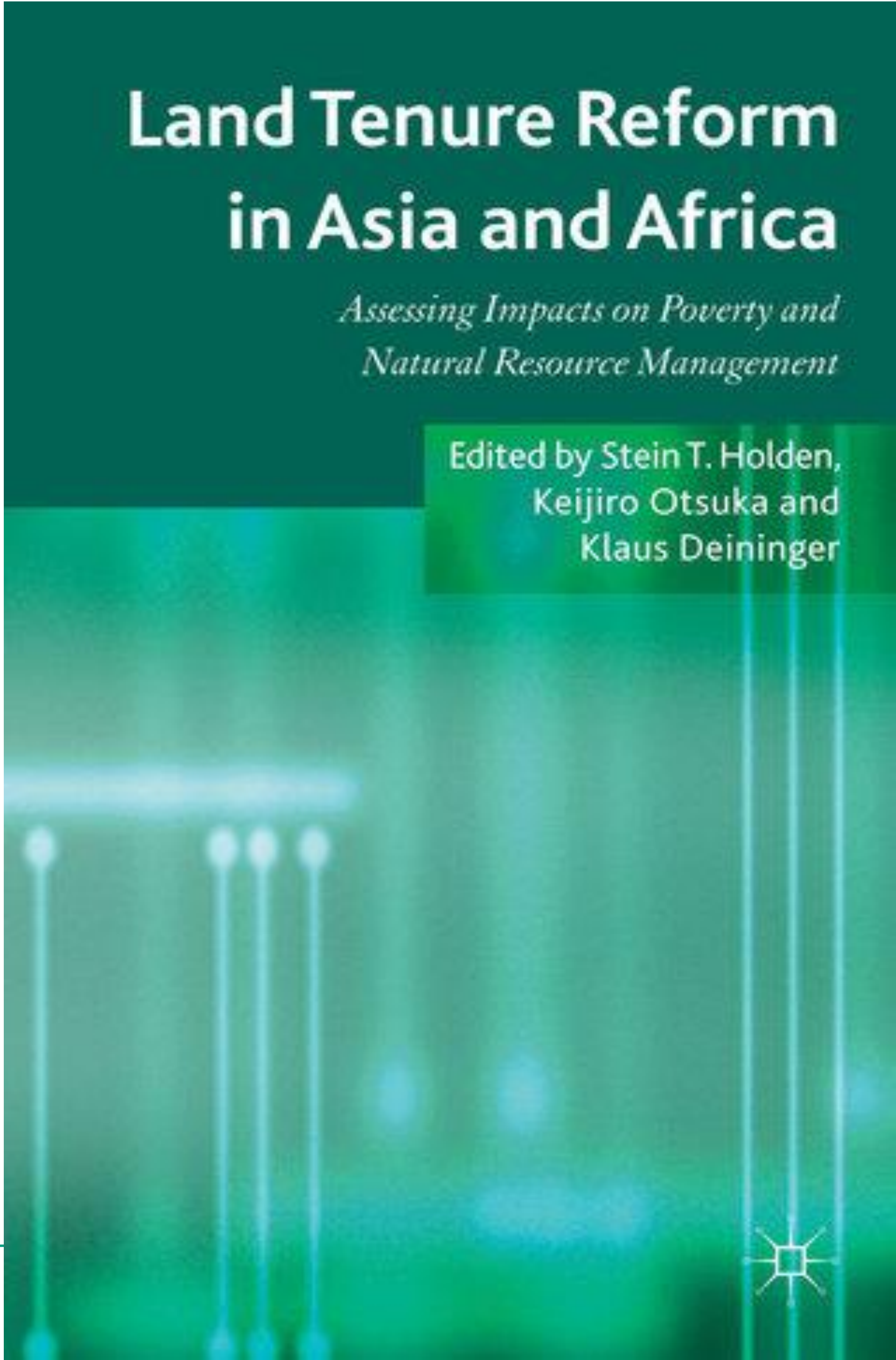
August 2013

- This book examines the impact of land tenure reforms on poverty reduction and natural resource management in countries in Africa and Asia with highly diverse historical contexts
- → **Importance of tenure security**

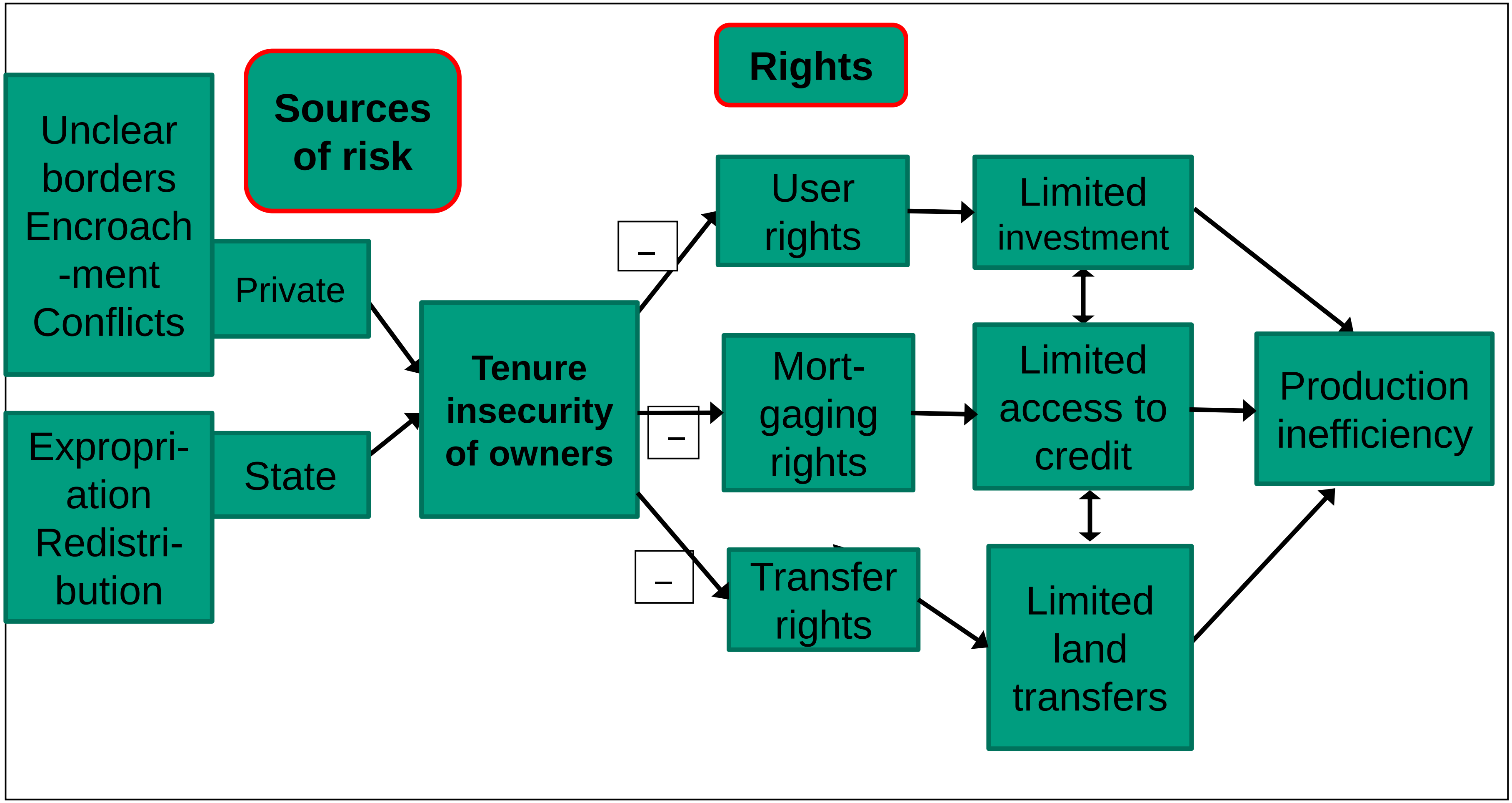


Sources of tenure insecurity

- Encroachment by neighbors
- Land grabs by powerful persons (elite capture)
- Unclear or unrecognized (customary) land rights
- State land – allocations to investors
- Expropriation by the state
  - For public use
  - For investment
  - Elite capture
- Political conflict areas

→Tenure insecurity → Food insecurity

Sources of tenure insecurity and impacts



Source: Holden et al. 2013

Successful tenure reform example:
Low-cost land registration and certification in Ethiopia

- **Increased investments and productivity**
  - Holden, Deininger and Ghebru (AJAE, 2009)
  - Deininger, Ali, Holden and Zevenbergen (WD, 2008)
  - Deininger, Ali and Alemu (LE, 2011)
- **Reduced land border conflicts**
  - Holden, Deininger and Ghebru (2011)
- **Increased land rental market participation, esp. FHH**
  - Holden, Deininger and Ghebru (JDS, 2011)
  - Deininger, Ali and Alemu (LE, 2011)
- **Positive welfare impacts (food security and nutrition) including Female landlord households**
  - Holden and Ghebru (2013)
  - Ghebru and Holden (2013)

Impact of land certification on log of calorie availability per consumer unit, HH FE models

Variable	1997–2010	2000–2010	2003–2010	2006–2010
Years with certificate	**0.031*** **	**0.035*** **	**0.071**** **	**0.052**
Sex of household head, Female = 1, male = 0	0.097	0.122*	0.136	0.251**
Farm size per consumer unit	0.082****	0.066****	0.050***	0.016
Sex of household head*Years with certificate	**0.014* **	**0.021** **	0.019	0.011
Operational holding size/Farm size, tenants	**0.076*** **	**0.121*** **	**0.137* **	**0.182** **
Operational holding size/Farm size, landlords	-0.027	-0.048	-0.076	-0.048
Year dummy for 1997	-0.190*			
Year dummy for 2000	-0.235**	-0.193*		
Year dummy for 2003	-0.069	-0.034	0.19	
Year dummy for 2006	0.076	0.085	0.206***	0.107
Constant	7.006****	6.933****	6.593****	6.756****
Prob > chi^2	0.000	0.000	0.000	0.000
Number of observations	1,459	1,161	863	565
R-squared	0.257	0.25	0.163	0.064

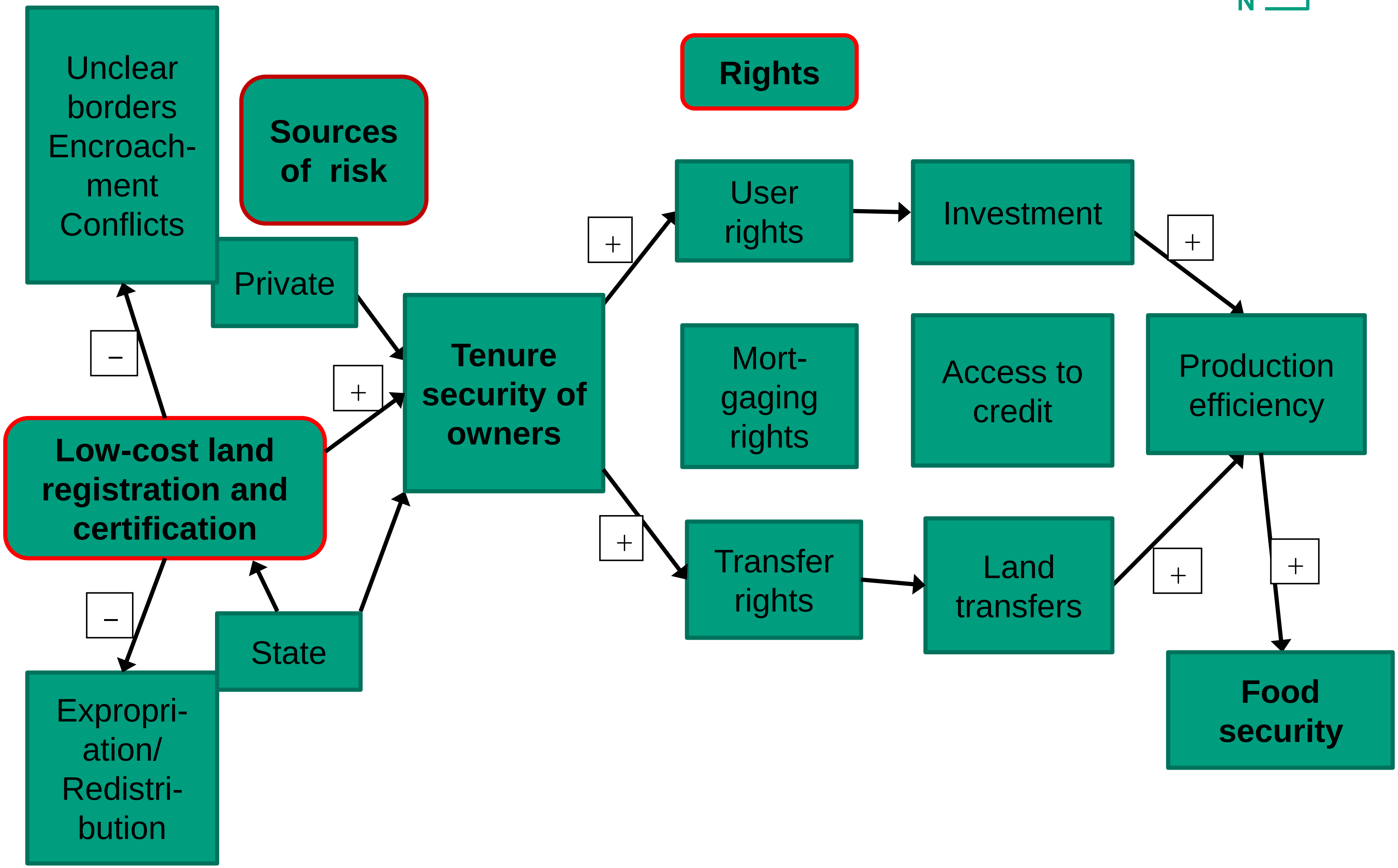
Source: Ghebru and Holden 2013

Impact of land certification on log of calorie availability per consumer unit, HH FE models

Variable	Tenants	Landlords	Pure owner-operators	All
Years with certificate	-0.012	**0.058****	**0.037****	0.031***
Sex of household head, Female = 1, male = 0	-0.183	0.135	0.148	0.097
Farm size per consumer unit	0.183****	0.150****	0.055***	0.082****
Sex of household head*Years with certificate	0.056	-0.005	0.006	0.014*
Operational holding size/Farm size tenants	**0.068****			0.076***
Operational holding size/Farm size landlords		-0.137		-0.027
Year dummy for 1997	-0.466	-0.029	-0.127	-0.190*
Year dummy for 2000	-0.386	0.105	-0.364**	-0.235**
Year dummy for 2003	-0.242	0.222	-0.027	-0.069
Year dummy for 2006	0.029	0.234*	0.075	0.076
Constant	7.313****	6.823****	6.977****	7.006****
Prob. > chi^2	0.000	0.000	0.000	0.000
Number of observations	326	370	784	1,459
R-squared	0.259	0.325	0.28	0.257

Source: Ghebru and Holden 2013

Low-cost land registration and certification impacts



Source: Holden et al. 2013

Conclusions

- Land rental markets enhance the flexibility of agricultural systems and contribute to adaptation to changing external and internal conditions, including multiple sources of risk and shocks
  - Enhancing equity and efficiency
  - Facilitate adaptation to climate change
  - Promotion of agricultural transformation
- The recent increase in demand for land in Africa revealed a need for better land goverance
  - A good understanding of the local context is essential for designing better land policies

Lessons from Household Studies II: Risk Preferences, Shocks and Technology Adoption

- *Climate risk represents an increasing threat to poor and vulnerable farmers in drought-prone areas of Africa.*
- *This study assesses the maize and fertilizer adoption responses of food insecure farmers in Malawi, where Drought Tolerant (DT) maize was recently introduced.*
- *Combine Household Survey Data and a Field Experiment, eliciting relative risk aversion, loss aversion and subjective probability weighting parameters of farmers*
- *Study for **CIMMYT-project: Adoption Pathways***

Risk Preferences, Shocks and Technology Adoption

- Some studies have found that more risk averse people are likely to be late adopters of new technologies
  - E.g. Liu (2013) found that more risk averse farmers adopted BT cotton (pest resistant variety) later in China
- Can risk aversion therefore hinder efficient adaptation to climate change?
- How does **risk preferences** affect adoption of new technologies that are better adapted to drought conditions?
  - Is Prospect Theory a better basis for predicting adoption behavior of poor & vulnerable people?
- How does exposure to **drought shocks** affect adoption of more Drought Tolerant maize varieties?

Setting: Small Farmers in Malawi

- Farm sizes: 0.25 ha – 5 ha
- Rain-fed agriculture
- Rainfall variability: Drought in form of dry spells in the rainy season are common
- Main staple crop: Maize planted on most of the land
- Majority are net buyers of maize (deficit producers)
- Large input subsidy program (FISP) provides subsidized fertilizer and maize seeds
- 2011/12: Drought year (70% of sample affected)
  - Combined hh farm survey and field experiments (to elicit risk preferences)

Field experiments on risk preferences and maize technology adoption in Malawi

How to measure technology adoption?

- Assess adoption of 3 types of maize:
  - **LM** (Local maize)
  - **DT** (Drought Tolerant) maize varieties
  - **OIMP** (Other improved) maize varieties
- Assess **Adoption** and **Intensity of Adoption** for each type of maize
  - Intensity measured as area planted to each type of maize (measured by GPS)
- Assess **Intensity of Fertilizer Use** on each type of maize (measured as kg Fertilizer by maize type)

Rapid Adoption of DT maize in Malawi:

Year		Local maize	**DT maize**	OIMP maize	Total
2006	No of plots	295	**20**	525	840
	% of plots	35.1	**2.4**	62.5	100.0
2009	No of plots	273	**130**	225	628
	% of plots	43.5	**20.7**	35.8	100.0
2012	No of plots	143	**249**	163	555
	% of plots	25.8	**44.9**	29.4	100.0
Total	No of plots	711	**399**	913	2,023
	% of plots	35.2	**19.7**	45.1	100.0

Double hurdle model: Maize adoption: First hurdle: Average Partial Effects

Maize type	DT		OIMP		LM	
Hurdle 1: Growing maize type	APE	Bootstr. SE	APE	Bootstr. SE	APE	Bootstr. SE
Relative risk aversion coefficient	**0 .329****	0.132	**-0.288****	0.132	**0.363****	0.146
Subjective probabilty weight (alpha)	-0.160	0.125	0.039	0.126	-0.035	0.135
Loss aversion coefficient (lambda)	**0.020****	0.009	0.006	0.009	-0.007	0.011
Number of shocks last 3 years	**0.051***	0.031	0.030	0.031	**-0.104*****	0.034
Drought 2011, dummy	**0.246****	0.100	-0.099	0.092	-0.121	0.102
Drought 2010, dummy	0.232	0.383	-0.147	0.189	-0.005	0.117
Age of household head	**-0.003***	0.002	-0.001	0.002	**0.007*******	0.002
Received subsidized seed voucher	**0.180*****	0.061	0.032	0.067	-0.027	0.073
Non-agricultural business, dummy	-0.072	0.055	0.098*	0.055	-0.014	0.059

Censored tobit models for **intensity of fertilizer use**
Dependent variable: log(kg Fertilizer+1).

	Models without endogenous variables			Models with endogenous variables		
RHS variables	Fertilizer on **DT**	Fertilizer on **OIMP**	Fertilizer on **LM**	Fertilizer on **DT**	Fertilizer on **OIMP**	Fertilizer on **LM**
Relative risk aversion coefficient	-0.433	**-3.235*** **	-0.587	-0.811	-1.413	-0.761
	(0.816)	(1.063)	(0.904)	(0.653)	(0.973)	(0.776)
Subjective probabilty weight	**2.054*** **	**3.613*** **	1.297	**2.082**** **	**2.912** **	**1.292* **
	(0.754)	(1.192)	(0.818)	(0.571)	(1.126)	(0.736)
Loss aversion coefficient	-0.022	0.051	0.010	0.012	0.004	-0.009
	(0.065)	(0.066)	(0.067)	(0.055)	(0.056)	(0.059)
Number of shocks last 3 years	-0.018	-0.254	-0.304	0.222	-0.101	0.047
	(0.158)	(0.250)	(0.270)	(0.140)	(0.232)	(0.246)
Drought 2012, dummy	0.109	-0.740	0.017	-0.171	-0.841	-0.207
	(0.662)	(0.684)	(0.615)	(0.512)	(0.563)	(0.593)
Drought 2011, dummy	-0.262	1.011*	0.157	-0.220	0.598	0.527
	(0.434)	(0.583)	(0.625)	(0.313)	(0.559)	(0.573)
Drought 2010, dummy	0.220	-0.959	-0.591	0.266	-0.748	-0.562
	(0.334)	(0.817)	(0.711)	(0.319)	(0.878)	(0.583)
Average rainfall, mm	**-0.009** **	**0.011*** **	-0.003	**-0.009*** **	**0.007** **	-0.003
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Received subsidized fertilizer voucher				**1.958**** **	**1.254*** **	**1.920**** **
				(0.331)	(0.473)	(0.427)
Received subsidized seed voucher				-0.475	-0.519	-0.104
				(0.351)	(0.473)	(0.384)
Log of savings for fertilizer purchase				**0.078** **	-0.004	**0.074* **
				(0.030)	(0.054)	(0.044)

Summary of findings

- Perceived riskiness of technologies matters for adoption
- Relative riskiness of technologies affects how risk aversion affects their adoption
  - **More risk averse households were more likely to adopt DT maize** (**risk averse hhs may not necessarily be late adopters**: Liu, 2013!)
  - **Exposure to drought shocks stimulated adoption of DT maize**
- Subjective probability weighting (**over-weighting of low probabilities → lower intensity of fertilizer use**)

Implications for policy

- Extreme weather events may be used to promote promising technologies (e.g. DT maize) as well as test the performance of alternative technologies

- Adoption of DT maize was stimulated by the **input subsidy program** (FISP)

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