

Web Appendix  
"Land Tenure and Investment Incentives: Evidence from West Africa"  
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April, 2010

**Table 1A: Data for Literature Review**

Paper	Investment	ITyp	Bin	TTyp	Nvar	Sig	AvgT	MaxT	TS	Cty	Rgn	N	HFE	Pub	Tab	Col
Abdulai, Owusu and Goezt (2008)	Trees	Tre	1	Acq	4	1	5.31	10.36	1	GH	W	560	0	0	2	1
	Mulch	Inp	1	Acq	4	1	2.11	2.89	1	GH	W	561	0	0	2	2
	Fertilizer	Inp	1	Acq	4	1	1.76	2.31	1	GH	W	562	0	0	2	3
	Manure	Inp	1	Acq	4	1	1.94	2.33	1	GH	W	563	0	0	2	4
Alemu (1999)	Soil Conservation	Imp	1	Acq	1	1	2.57	2.57	0	ET	H	2146	0	0	3.2	1
Ali, Dercon and Gautam (2007)	Share alloc. to Coffee	Tre	0	Tfr	1	1	9.96	9.96	1	ET	H	2151	1	0	4	3
	Share alloc. to Eucalyptus	Tre	0	Tfr	1	1	1.85	1.85	1	ET	H	2151	1	0	6	6
	Share alloc. to Chat	Tre	0	Tfr	1	1	2.42	2.42	1	ET	H	2151	1	0	6	2
	Share alloc. to all trees/shrubs	Tre	0	Tfr	1	1	9.84	9.84	1	ET	H	2151	1	0	7	2
Amsalu and de Graaf (2007)	Coffee Fixed Effects	Tre	0	Mul	2	1	2.31	3.10	0	ET	H	356	0	0	8	1
	Adpoted stone terraces	Imp	1	Ins	1	0	0.80	0.80	0	ET	H	147	0	1	3	1
Anim (1999)	Continued use of stone terraces	Imp	1	Ins	1	0	0.52	0.52	0	ET	H	147	0	1	3	2
	Silt Traps	Imp	1	Ins	1	0	1.45	1.45	0	ZA	S	190	0	1	2	1
Anley, Bogale, and Haile-Gabriel (2007)	Contour Ploughing	Imp	1	Ins	1	0	0.98	0.98	0	ZA	S	190	0	1	2	2
	Soil bunds	Imp	0	Ins	1	0	0.16	0.16	0	ET	H	204	0	1	4	1
	Cut-off drains	Imp	0	Ins	1	0	0.79	0.79	0	ET	H	204	0	1	4	2
	Fanyajuu	Imp	0	Ins	1	0	0.97	0.97	0	ET	H	204	0	1	4	3
Baland et al. (1999)	Trash Lines	Imp	0	Ins	1	0	0.19	0.19	0	ET	H	204	0	1	6	1
	Tree Planting	Tre	0	Mul	1	0	1.27	1.27	1	UG	E	452	0	0	13	1
Bekele and Drake (2003)	Type of soil conservation	Imp	1	Ins	1	0	0.95	0.95	0	ET	H	265	0	1	4	All
	Stone terraces	Imp	0	Ins	2	0			0	ET	H	94	0	1	2	1
	Drainage ditches	Imp	0	Ins	2	0			0	ET	H	94	0	1	2	2
	Irrigation canals	Imp	0	Ins	2	0			0	ET	H	93	0	1	2	3
	Live barriers	Imp	0	Ins	2	0			0	ET	H	94	0	1	2	4
	Traditional fallow	Fal	0	Ins	2	1			0	ET	H	92	0	1	2	5
	Fertilizers	Inp	0	Ins	2	1			0	ET	H	93	0	1	3	1
	Pesticides	Inp	0	Ins	2	0			0	ET	H	94	0	1	3	2
Benin and Pender	Improved Seeds	Inp	0	Ins	2	0			0	ET	H	93	0	1	3	3

(2001)	Local barley	Inp	0	Ins	2	1			0	ET	H	70	0	1	3	4
	Local wheat	Inp	0	Ins	2	1			0	ET	H	53	0	1	3	5
	Local teff	Inp	0	Ins	2	1			0	ET	H	74	0	1	3	6
	Improved wheat	Inp	0	Ins	2	1			0	ET	H	41	0	1	3	7
	Waterways	Imp	0	Ins	1	0			0	ET	H	86	0	1	4	2
	Burning to clear field	Inp	0	Ins	1	0			0	ET	H	86	0	1	4	3
	Crop rotation	Inp	0	Ins	1	0			0	ET	H	86	0	1	4	5
	Herbicides	Inp	0	Ins	1	1			0	ET	H	70	0	1	5	3
Besley (1995)	Tree Planting	Tre	1	Tfr	2	1	1.48	1.94	1	GH	W	1074	1	1	4	2
	Drainage	Imp	1	Tfr	2	0	1.29	1.34	1	GH	W	494	0	1	5	1
	Manuring	Inp	1	Tfr	2	0	0.14	0.17	1	GH	W	494	0	1	5	2
	Excavation	Imp	1	Tfr	2	0	1.42	1.45	1	GH	W	494	0	1	5	3
	Irrigation	Imp	1	Tfr	2	0	1.41	1.53	1	GH	W	494	0	1	5	4
	Mulching	Inp	1	Tfr	2	0	0.70	1.00	1	GH	W	494	0	1	5	5
	Shallot Beds	Imp	1	Tfr	2	0	0.87	0.97	1	GH	W	494	0	1	5	6
Brasselle et al. (2002)	Any Investment	Mul	1	Mul	4	1	1.28	1.87	1	BF	W	135	0	1	7	1
Bruck (2003)	No. of Investments	Mul	0	Ins	1	0			1	MZ	E	371	0	0		
Clay, Reardon, and Kangasniemi (1998)	Conservation investments	Imp	0	Acq	1	1			0	RW	E	5596	0	1	2	1
	Organic inputs	Inp	0	Acq	1	1			0	RW	E	5596	0	1	2	2
	Chemical inputs	Inp	0	Acq	1	1			0	RW	E	5596	0	1	2	3
Deininger and Ali (2008)	Any Tree	Tre	1	Acq	6	1	1.99	4.39	0	UG	E	5448	1	1	4	1
	Tree investment last 5 years	Tre	1	Acq	6	1	4.17	13.62	0	UG	E	5448	1	1	4	2
	Soil Conservation	Imp	1	Acq	6	1	2.58	10.38	0	UG	E	5448	1	1	4	3
Deininger, Ali and Alemu (2008)	Manure application	Inp	1	Acq	6	1	1.75	5.50	0	UG	E	5448	1	1	4	4
	Soil or water conservation	Imp	1	Ttl	1	1	10.32	10.32	0	ET	H	8671	0	0	7	3
Deininger et al. (2008)	Investment	Mul	1	Ttl	1	1	2.85	2.85	0	ET	H	7944	0	1	8	1
Deninger, Ali and Yamano (2008)	Planted Trees	Tre	1	Mul	5	1	3.83	4.70	1	UG	E	2185	0	1	4	1
	Soil Conservation	Imp	1	Mul	5	1	1.84	3.36	1	UG	E	2185	0	1	4	2
	Trees Planted	Tre	0	Mul	5	1	4.17	5.69	1	UG	E	2185	0	1	4	3
Deninger and Jin	Planted Trees	Tre	1	Ins	4	1	2.24	4.72	0	ET	H	6847	0	1	3	3

(2006)	Made Terraces	Imp	1	Ins	4	1	3.71	6.94	0	ET	H	6847	0	1	3	4
Dercon and Krishnan (n.d.)	Share alloc. to perennial crops	Tre	0	Tfr	1	1	1.75	1.75	1	ET	H	9833	1	0	2	2
Dube (2009)	Plantation crops	Tre	1	Acq	1	1	2.46	2.46	0	ZW	S	116	0	0	26	
	Long-term investments	Imp	1	Acq	1	1	2.12	2.12	0	ZW	S	116	0	0	27	
	Medium-term improvements	Mul	1	Acq	1	0	0.91	0.91	0	ZW	S	116	0	0	28	
Gavian and Fafchamps (1996)	Manuring	Inp	0	Acq	2	1	1.10	2.17	0	NE	W	122	1	1	2	3
Gebremedhin, Pender and Ehui (2003)	Stone terrace	Imp	0	Ins	2	1			0	ET	H	91	0	0	10	1
	Tree planting	Tre	0	Ins	2	0			0	ET	H	88	0	0	10	2
	Soil bund	Imp	0	Ins	2	0			0	ET	H	91	0	0	10	3
	Fallow	Fal	0	Ins	2	0			0	ET	H	91	0	0	11	1
	Compost	Inp	0	Ins	2	0			0	ET	H	91	0	0	11	2
Gebremedhin and Swinton (2003)	Adpoted stone terraces	Imp	1	Mul	4	1	1.64	2.00	0	ET	H	638	0	1	2	1
	Adpoted soil bunds	Imp	1	Mul	4	1	2.16	3.29	0	ET	H	638	0	1	2	3
	Density of stone terraces	Imp	0	Mul	4	0	0.99	1.41	0	ET	H	139	0	1	3	2
Goldstein and Udry (2008)	Fallow duration	Fal	0	Acq	3	1	1.75	2.89	0	GH	W	402	1	1	7	4
Gray and Kevane (2001)	Manuring	Inp	0	Acq	3	1	1.17	1.71	0	BF	W	151	0	1	5	1
	Fertilizer use	Inp	0	Acq	3	1	1.27	2.22	0	BF	W	154	0	1	5	2
	Yrs cult. since last fallow	Fal	0	Acq	3	1	1.57	1.75	0	BF	W	114	0	1	5	3
	Animals corralled on field	Inp	1	Acq	3	1	1.57	3.00	0	BF	W	156	0	1	5	4
	Trees per hectare	Tre	0	Acq	3	0	0.46	0.71	0	BF	W	152	0	1	5	5
	Anti-erosion measures	Imp	1	Acq	3	0	0.67	1.00	0	BF	W	153	0	1	5	7
Hagos and Holden (2006)	Adpoted stone terraces	Imp	1	Mul	7	1	1.02	1.88	0	ET	H	1346	0	1	4	1
	Adpoted soil bunds	Imp	1	Mul	7	0	0.67	1.50	0	ET	H	1346	0	1	4	2
	Length of soil bunds	Imp	0	Mul	7	0	0.38	0.93	0	ET	H	1346	0	1	5	1
	Length of stone terraces	Imp	0	Mul	7	1	0.78	2.01	0	ET	H	1346	0	1	5	2
Hayes, Roth and Zepeda (1997)	Wells and fences	Imp	1	Tfr	2	1	1.45	2.10	0	GM	W	567	0	1	2	1
	Presence of trees	Tre	1	Tfr	2	1	2.97	3.55	0	GM	W	567	0	1	3	1
	Medium-term soil impr.	Imp	1	Tfr	2	1	1.50	2.62	0	GM	W	567	0	1	4	1
Holden, Deininger, and Ghebru (2009)	Soil Conservation	Imp	1	Ttl	1	1	2.21	2.21	1	ET	H	1410	0	1	3	1
	Eucalyptus	Tre	0	Ttl	1	1	1.72	1.72	1	ET	H	1073	0	1	4	1

Holden and Yohannes (2002)	Tree Seedlings	Tre	0	Ttl	1	1	1.66	1.66	1	ET	H	1079	0	1	4	2
Holden and Yohannes (2002)	Adpoted purchased inputs	Inp	1	Ins	1	0	0.84	0.84	0	ET	H	496	0	1	3	2
	Quantity of purchased inputs	Inp	0	Ins	1	0	0.39	0.39	0	ET	H	445	0	1	4	1
Jacoby and Minten (2005)	Adpoted perennials	Tre	1	Ins	1	0	0.18	0.18	0	ET	H	135	0	1	5	2
	Irrigation/Drainage	Imp	1	Ttl	1	0	0.58	0.58	0	MG	E	2652	1	1	6	1
	Protective Bunds	Imp	1	Ttl	1	0	0.67	0.67	0	MG	E	2652	1	1	6	3
	Land Leveling	Imp	1	Ttl	1	0	1.40	1.40	0	MG	E	2652	1	1	6	5
Kabubo-Mariara (2005)	All Investments	Mul	1	Ttl	1	0	0.94	0.94	0	MG	E	2652	1	1	6	7
	Any Investment	Mul	1	Acq	1	1	3.57	3.57	0	KE	E	570	0	1	2	1
Kabubo-Mariara (2007)	Soil bunds	Imp	1	Mul	4	1	1.80	2.48	0	KE	E	1600	0	1	2	1
	Terracing	Imp	1	Mul	4	1	0.99	1.90	0	KE	E	1600	0	1	2	2
	Drought-resistant veg/trees	Tre	1	Mul	4	0	1.06	1.63	0	KE	E	1600	0	1	2	3
	All conservation	Mul	1	Mul	4	1	1.14	1.88	0	KE	E	1600	0	1	2	4
Kabubo-Mariara et al. (2006)	Adpoted grass strips	Inp	1	Mul	3	1	0.99	1.89	0	KE	E	684	0	0	8.2a	1
	Adpoted mulching	Inp	1	Mul	3	1	2.12	2.68	0	KE	E	684	0	0	8.2a	2
	Adpoted other investments	Mul	1	Mul	3	1	1.60	2.04	0	KE	E	684	0	0	8.2a	3
	Adpoted tree planting	Tre	1	Mul	3	1	3.10	4.90	0	KE	E	684	0	0	8.2a	4
	Adpoted terracing	Imp	1	Mul	3	1	3.02	4.18	0	KE	E	684	0	0	8.2b	1
	Adpoted soil terraces	Imp	1	Mul	3	0	1.08	1.56	0	KE	E	684	0	0	8.2b	2
	Adpoted grass strip terraces	Imp	1	Mul	3	1	2.26	2.97	0	KE	E	684	0	0	8.2b	3
	Adpoted permanent investments	Mul	1	Mul	3	1	1.99	4.88	0	KE	E	684	0	0	8.2b	4
	Adpoted seasonal investments	Inp	1	Mul	3	1	1.71	2.81	0	KE	E	684	0	0	8.2b	5
	Intensity of all investments	Mul	0	Mul	3	1	2.74	5.83	0	KE	E	684	0	0	8.3	1
Kazianga and Masters (2002)	Bunds	Imp	0	Acq	1	1	7.81	7.81	0	BF	W	258	0	1	3	1
	Microcatchments	Imp	0	Acq	1	1	2.80	2.80	0	BF	W	258	0	1	3	1
Matlon (1994)	Manure per hectare	Inp	0	Acq	3	1	1.29	4.29	0	BF	W	850	1	0	3-11	1-5
	Share of HH manure	Inp	0	Acq	3	1	1.42	4.13	0	BF	W	850	1	0	3-11	5-10
	Chemical fertilizer per hectare	Inp	0	Acq	3	1	1.05	2.72	0	BF	W	850	1	0	3-12	1-5
	Share of HH fertilizer	Inp	0	Acq	3	1	0.94	1.83	0	BF	W	850	1	0	3-12	5-10
Moor and Nieuwodt (1998)	Any Investment	Mul	1	Mul	1	1	3.90	3.90	0	ZW	S	236	0	1	1	1
	Slash-and-burn	Inp	1	Acq	10	1			0	UG	E	1161	0	0	4.7	1
	Fertilizer use	Inp	1	Acq	10	1			0	UG	E	755	0	0	4.7	2

Nkonya et al (2003)	Manure and composting	Inp	1	Acq	10	1			0	UG	E	1177	0	0	4.7	3
	Incorporation of crop residues	Inp	1	Acq	10	0			0	UG	E	1183	0	0	4.7	4
	Rotatation of crops	Imp	1	Acq	10	1			0	UG	E	1183	0	0	4.7	5
	Mulching	Inp	1	Acq	10	1			0	UG	E	1177	0	0	4.7	6
	Incorporation of HH residues	Inp	1	Acq	10	1			0	UG	E	1168	0	0	4.7	7
Otsuka et al. (2003)	Proportion planted to cocoa	Tre	0	Acq	10	1	2.59	6.58	0	GH	W	688	1	1	6	1
	Probability of fallow	Fal	0	Acq	8	1	1.01	2.70	0	GH	W	483	1	1	6	2
Pender and Fafchamps (2006)	Labor Use	Inp	0	Acq	3	0			0	ET	H	127	1	1	5	4
	Oxen Use	Inp	0	Acq	3	1			0	ET	H	127	1	1	5	5
Place (1995)	Trees per parcel area	Tre	0	Mul	6	1			0	BI	E	75	0	0	6.1	1-4
	Probability of tree planting	Tre	1	Mul	7	0			0	UG	E	85	0	0	6.1	5-6
	Probability of tree planting	Tre	1	Mul	9	1			0	ZM	S	99	0	0	6.1	7-8
	Probability of tree planting	Tre	1	Acq	1	0			0	MW	S	127	0	0	6.1	9
Place and Hazell (1993)	Any Investment	Mul	1	Tfr	3	1			0	RW	E	629	0	1	2	1
	Any Investment	Mul	1	Tfr	1	1			0	RW	E	524	0	1	2	2
	Any Investment	Mul	1	Tfr	2	1			0	RW	E	469	0	1	2	3
	Drainage or Excavation	Imp	1	Tfr	2	1			0	GH	W	356	0	1	2	4
	Planting trees	Tre	1	Tfr	3	1			0	GH	W	548	0	1	2	5
	Planting trees or destumping	Tre	1	Tfr	1	0			0	GH	W	254	0	1	2	6
	Tree planting or terracing	Mul	1	Tfr	2	0			0	KE	E	118	0	1	2	7
Place and Otsuka (2001)	Drainage or Liming	Imp	1	Tfr	1	1			0	KE	E	97	0	1	2	8
	Years farming tobacco	Inp	0	Acq	3	1	2.82	3.88	0	MW	S	187	0	1	6	1
	Trees per hectare	Tre	0	Acq	3	1	0.99	1.85	0	MW	S	187	0	1	7	1
	Pole Trees per hectare	Tre	0	Acq	3	1	0.97	2.09	0	MW	S	187	0	1	7	2
	Terracing or leveling	Imp	1	Acq	3	0	0.41	0.73	0	MW	S	187	0	1	7	3
Place and Otsuka (2002)	Water Management	Imp	1	Acq	3	0	0.38	0.56	0	MW	S	187	0	1	7	4
	Pct. of parcel under coffee	Tre	0	Mul	4	0	0.51	1.19	0	UG	E	103	0	1	4	1
	Field fallowed in last ten years	Fal	1	Mul	4	1	1.46	2.23	0	UG	E	103	0	1	4	2
	Trees planted per hectare	Tre	0	Mul	4	1	0.87	2.03	0	UG	E	103	0	1	5	1
Use of formal credit	Fruit trees planted per hectare	Tre	0	Mul	4	1	0.67	1.71	0	UG	E	103	0	1	5	2
	Use of formal credit	Mul	1	Mul	3	1			0	ZM	S	175	0	0	5.10	
	Presence of oxen	Inp	1	Mul	3	1			0	ZM	S	175	0	0	5.10	
Organic fertilizer input	Inp	1	Mul	3	1			0	ZM	S	175	0	0	5.10		

Place et al (1995)	Earthwork structures	Imp	1	Mul	3	1		0	ZM	S	175	0	0	5.10		
	Waterwork structures	Imp	1	Mul	3	0		0	ZM	S	175	0	0	5.10		
	Fencing	Imp	1	Mul	3	0		0	ZM	S	175	0	0	5.10		
	Fruit trees	Tre	1	Mul	3	1		0	ZM	S	175	0	0	5.10		
	Multipurpose trees	Tre	1	Mul	3	1		0	ZM	S	175	0	0	5.10		
Roth, Cochrane, and Kisamba-Mugerwa (1994)	Continuous manuring	Inp	1	Ttl	2	1	1.81	2.00	0	UG	E	480	0	0	A	2
	Mulching	Inp	1	Ttl	2	1	1.36	2.61	0	UG	E	480	0	0	A	4
	Fencing	Imp	1	Ttl	2	1	2.34	2.43	0	UG	E	480	0	0	A	6
	Treess	Tre	1	Ttl	2	1	0.96	1.69	0	UG	E	480	0	0	A	2
	Terracing	Imp	1	Ttl	2	0	0.44	0.58	0	UG	E	480	0	0	A	4
	Non-farm buildings	Imp	1	Ttl	2	0	1.27	1.43	0	UG	E	480	0	0	A	6
Roth, Unruh and Barrows (1994)	Leveling by machine	Imp	1	Ins	1	0	1.16	1.16	0	SO	H	183	0	0	A	2
	Leveling by hand or machine	Imp	1	Ins	1	0	0.95	0.95	0	SO	H	183	0	0	A	4
	Bunding	Imp	1	Ins	1	0	0.92	0.92	0	SO	H	183	0	0	A	2
	Cash value of canal maintenance	Imp	0	Ins	1	0	0.31	0.31	0	SO	H	183	0	0	A	4
Sakurai (2006)	Watter supply canals	Imp	1	Acq	3	1	2.04	2.88	0	CI	W	63	0	1	6	1
	Modern rice varieties	Inp	1	Acq	3	0	0.97	1.45	0	CI	W	63	0	1	6	2
Shiferaw and Holden (1998)	Soil Conservation	Imp	0	Ins	1	0			0	ET	H	452	0	1	3	4
Smith (2004)	Aggregate investment by cost	Mul	0	Ttl	5	1	1.09	2.44	0	ZM	S	239	0	1	3	1
	Aggregate investment by points	Mul	0	Ttl	5	1	0.82	2.09	0	ZM	S	241	0	1	3	2
Tikabo (2003)	Adpoted chemical fertilizer	Inp	1	Acq	3	0	1.07	1.64	0	ER	H	1456	0	0	4	1
	Adpoted animal manure	Inp	1	Acq	3	1	2.34	2.88	0	ER	H	1363	0	0	4	2
	Intensity of animal manure	Inp	0	Acq	3	1	0.85	1.96	0	ER	H	164	0	0	5	2
	Intensity of chemical fertilizer	Inp	0	Acq	3	1	2.03	2.92	0	ER	H	989	0	0	6	2
Yirga (2006)	Stone/Soil Bund	Imp	0	Acq	1	1	2.26	2.26	0	ET	H	1141	0	0	3	1
Yirga and Hassan (2006)	Stone/Soil Bund	Imp	0	Acq	1	1	2.58	2.58	0	ET	H	1141	0	1	5	1
Zerfu (2007)	Manure application	Inp	1	Ins	1	1	3.09	3.09	1	ET	H	2304	0	0	3	1
	Tree planting	Tre	1	Ins	1	0	0.80	0.80	1	ET	H	2267	0	0	3	2
	Soil Conservation	Inp	1	Ins	1	1	3.09	3.09	1	ET	H	2302	0	0	3	3
Zikhali (2008)	Contour ridging (any)	Imp	1	Mul	1	0	1.42	1.42	1	ZW	S	592	0	0	7	2
	Contour ridging (length)	Imp	0	Mul	1	1	2.21	2.21	1	ZW	S	592	0	0	7	3

**Notes on variables:** Investment type (ITyp) is trees, input, improvement, fallow, or multiple. Binary (Bin) is whether the investment is 0/1. Tenure type (TTyp) is acquisition method, transfer rights, insecurity, title or registration, or multiple. Significance (Sig) indicates at least one tenure measure was significant at the 10% level ( $t > 1.65$ ). AvgT is the average t-statistic on the tenure measures. MaxT is the maximum t-statistic on the tenure measures. Two-stage (TS) indicates an IV or similar procedure. Country (Cty) is abbreviated using standard ISO codes. Region (Rgn) is West, Horn, South, or East. Household fixed effects (HFE) indicates household or finer fixed effects are used. N is sample size. Pub indicates the paper was published in a peer-reviewed journal. Tab indicates the specific table from the article, and Col indicates the specific column.

**Notes on coding:** Alemu (1999): Deviation of landholding size from village mean not treated as "measure of tenure insecurity," though it is by the author. Amsalu and de Graaf (2007): The authors do not treat temporary acquisition as a land tenure variable, so I do not either. Bekele and Drake (2003): The authors use multinomial logit; this is treated here as "binary" rather than "continuous." Benin and Pender (2001): Some investments occur in multiple tables; I take the first appearance of each variable. Observations are at the village level (proportion of households). Besley (1995): T-statistics are not reported directly; these are taken from my own replication of the study. Bruck (2003): Insignificance is not shown in the table, but stated on p. 13 of the text. Deininger, Ali and Alemu (2008): Column 3 (binary) chosen over column 6 (continuous). Following the authors, years of ownership is not treated as a tenure variable. Random effects not treated as fixed effects. Deininger and Ali (2008): Table 4 (linear probability) used over Table 5 (semiparametric tobit). Deininger, Ali and Yamano (2008): Knowledge of land law not treated as tenure variable. Deininger and Jin (2006): Columns 5 and 6 include sale and mortgage rights and could also be used; I select column 3 because security is the main point in their argument. Dercon and Krishnan (n.d.): T-statistics calculated by me. Gebremedhin, Pender and Ehui (n.d.): Observations are at the village level (proportion of households). Hagos and Holden (2006): Not treated as IV, since time preference rather than tenure is treated as endogenous. Holden and Yohannes (2002): p-values converted into t-statistics by me. Interaction effect not treated as land tenure variable. Jacoby and Minten (2005): Panel "A" selected (binary investment measures), and columns with title not divided into up-to-date and out-of-date chosen. Kazianga and Masters (2002): Tobit model selected. Labor-intensity of livestock tending not treated as a tenure variable. Matlon (1994): He disaggregates his regressions by region, and does report the number of observations. T-statistics from all four regions have been considered in for the average and maximum, while the sample size is taken as roughly the average degrees of freedom across regions. Place (1995): Sample sizes averaged across columns. Place and Otsuka (2002): Interaction effects not treated as tenure variables. Roth, Cochrane, and Kisamba-Mugerwa (1994): Model (II) selected, where voluntary and involuntary title treated separately. Roth, Unruh and Barrows (1994): Model B (insecurity index) used rather than Model A (title). Shiferaw and Holden (1998): Not treated as two-stage, since IV is for another variable. Yirga (n.d.) and (2006): T ratio calculated by me. Zerfu (2007): Table 3 (bivariate probit) chosen over Table 5 (random effects probit). Zikhali (2008): Though the tenure variable is labeled "tenure security," it is an index of acquisition and transfer variables.



Table 1B: Literature Review by Region

	(1)		(2)		(3)	
	East Africa		West Africa		Horn of Africa	
0/1 Investment Measure	0.16	(0.67)	-0.07	(-0.28)	-0.02	(-0.20)
No. of Tenure Vars.	0.04	(1.18)	-0.01	(-0.26)	0.03	(0.41)
HH/Finer FE	-0.61	(-2.01)*	0.08	(0.25)	-0.50	(-2.20)**
Two Stage/IV	-0.15	(-0.69)	-0.31	(-0.97)	0.42	(3.16)***
Sample Size/1000	0.10	(1.91)*	0.29	(0.32)	0.07	(2.39)**
Published in Journal	0.17	(1.05)	-0.29	(-0.56)	0.04	(0.43)
Fallow	0.13	(0.75)	0.18	(0.89)	0.05	(0.18)
Improvement	-0.09	(-0.51)	0.19	(0.49)	-0.10	(-0.47)
Multiple	0.09	(0.58)	0.71	(1.92)*	-0.11	(-0.38)
Tree	-0.11	(-0.56)	0.15	(0.39)	-0.07	(-0.25)
Acquisition	0.02	(0.12)			0.38	(1.37)
Insecurity	-0.39	(-1.04)			-0.37	(-1.40)
Title/Registration	-0.14	(-0.50)			-0.00	(-0.02)
Transfer Rights	-0.07	(-0.44)	-0.19	(-0.37)	0.17	(0.38)
Horn						
South						
West						
Observations	55		36		68	
No. of Studies	14		12		22	

This table replicates Column (1) of Table 1, except that the results use OLS, since there are many "perfect predictors" in each regional sub-sample that are dropped if a probit is used. There are not enough observations from Southern Africa to do this for that region. The negative effect of household fixed effects on statistical significance is concentrated in the East and Horn, where it is less common for households to hold multiple plots under different tenure regimes, i.e. where there is less identifying variation. Studies that use a two-stage procedure in the horn are more likely than those that do not to find a statistically significant effect. If the endogeneity of land rights is the explanation, this would be expected for tenure-weakening investments. There are four studies (with eleven regressions) from the Horn that use two-stage procedures; Ali, Dercon and Gautam (2007), Dercon and Krishnan (n.d.), Holden, Deininger, and Ghebru (2009), Pender and Fafchamps (2006) and Zerfu (2007). The investments considered in these regressions do not fit the tenure-weakening profile – 8 are related to tree-planting, 2 to soil conservation, and the other is manure. My suspicion is that the instruments used are not necessarily excludable, and predict both rights and investment. Ali, Dercon and Gautam (2007) include the years the land has been held as an instrument, which may be an indicator of land quality. Dercon and Krishnan (n.d.) report an overidentification test that rejects the exclusion restriction at the 10% level. Holden, Deininger, and Ghebru (2009) do not have strong instruments for whether the cultivator has a certificate, and so instead rely on a matching approach in which the predicted probability of having a certificate and the error from this "first stage" probit are included in the investment equation; this paper is an exception, in that its conservative approach would be expected to produce false insignificance rather than finding a spurious correlation between certificates and title. Zerfu (2007) controls for endogeneity using a bivariate probit model, but again includes the worrisome variable tenure length. The greater importance of sample size in East Africa and the Horn is likely due to the larger range in sample sizes in studies from this region – there is more variation with which to identify the effect. The greater coefficient and statistical significance on "multiple" for West Africa suggests that the various investments available in this region may be more substitutable than elsewhere. With these exceptions, the results are fairly stable across regions.

**Table 2: List of Data Sets Used**

Dataset	Year(s)	Observation Level	Measure of Investment	Measure of Land Rights	Estimator	Fixed Effects
<i>Type I Datasets: Plot-level data with continuous measures of investment.</i>						
Benin SFS	1998	Plot	Labor (family and hired), fertilizer, pesticide	Mode of acquisition, whether owned	Honore's tobit	HH-Crop
ICRISAT Burkina Faso Farm-Level Studies (A)	1981-83	Plot	Labor (family and hired), fertilizer, pesticide, animal traction, length of fallow	None	Honore's tobit	HH-Year-Crop
ICRISAT Burkina Faso Farm-Level Studies (B)	1984-85	Plot	Family labor, fertilizer, seed, length of fallow	Mode of acquisition, grantor	Honore's tobit	HH-Year-Crop
Goldstein-Udry Ghana (Akwapim) Survey	1996/97-98/99	Plot	Labor (family and hired), chemicals, seed, length of fallow	Alienation rights, mode of acquisition, years of tenure, grantor	Honore's tobit	HH-Crop
Udry Nigeria (Zaria) Survey	1988-89	Land divided into: Owned/Borrowed X Goma/Fadama	Proportion fallow	Whether land is owned	Honore's tobit	HH
<i>Type II Datasets: Plot-level data with binary measures of investment.</i>						
World Bank Ghana Survey (Anloga Section)	1988	Plot	Drainage, tree crops, manuring, excavation, irrigation, mulching, making shallot beds	Alienation rights, mode of acquisition, years of tenure, title deed, previous litigation	IV	Village
IFPRI Ghana SN	2001	Plot	Household and exchange labor, manure, household waste, fertilizer, seed	Mode of acquisition	OLS	HH-Crop
Ghana LSS (A)	1989-90	Plot	Tree planting	Mode of acquisition, whether plot is owned, deed, rights to sell and use as security	OLS	HH-Year
IFPRI Mali ZLH	1987-88	Plot	Whether plot fully exploited and why not.	Mode of acquisition	OLS	HH-Round
<i>Type III Datasets: Household-level data with continuous measures of investment.</i>						
Ghana LSS (B)	1987-88	Household	Seed, fertilizer, manure, insecticide, proportion fallow	Rights to sell and lend or sharecrop	Newey's IV-tobit	Region
Ivory Coast LSMS	1985-88	Household	Seed, fertilizer, manure, insecticide, proportion fallow	Rights to sell or transfer	Newey's IV-tobit	Rainfall Station

**Table 3A: Input Use and Land Tenure, Benin SFS 1998**

	Male Labor (Hours/Ha)	Female Labor (Hours/Ha)	Child Labor (Hours/Ha)	Hired Labor (Hours/Ha)	Fertilizer (Kg/Ha)	Pesticide (Cost/Ha)
Land Owned	20.2 [0.7798]	56.32 [0.6379]	217.6 [0.6031]	-16.57 [0.4337]	-1.088 [0.01832]	2976 [0.4562]
Spouse Controls Plot	-250 [1.877]*	40.45 [1.028]	-214.1 [1.673]*	-27.59 [0.4293]	94.24 [3.124]***	1.86E+04 [5.057]***
Spouse Controls X Owned	-29.99 [0.4367]	-93.71 [1.16]	-157.7 [0.8041]	-15.22 [0.1405]	50.75 [1.093]	2707 [0.2661]
Area (Hectares)	-545 [1.087]	-518.9 [1.423]	-1373 [1.868]*	-420.6 [0.8602]	62.67 [3.437]***	1.06E+04 [4.378]***
Area Squared	20.32 [0.09979]	10.33 [0.06933]	110.9 [1.749]*	8.235 [0.8432]	-4.894 [2.513]**	-1047 [2.817]***
Distance (Km)	19.08 [1.022]	32.67 [1.007]	163.2 [1.047]	27.94 [0.7034]	-6.809 [0.1823]	1529 [1.15]
Distance Squared	-0.4127 [0.8811]	-0.9952 [0.9116]	-6.52 [0.7007]	-0.7078 [0.679]	-1.644 [0.3692]	-71.44 [0.9293]
Irrigated	-484.7 [1.401]	-48.82 [0.2237]	-120.2 [0.2608]		302.4 [1.983]**	
Bas Fond	-39.99 [0.4166]	94.98 [0.6804]	1409 [0.5783]	68.78 [0.2363]	-50.68 [0.4555]	-1.89E+04 [2.208]**
Observations	4329	4329	4329	4329	4329	4329
Number of FE	1419	1419	1419	1419	1419	1419

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-season-crop fixed effects.

**Table 3B: Input Use and Land Tenure, Benin SFS 1998**

	Male Labor (Hours/Ha)	Female Labor (Hours/Ha)	Child Labor (Hours/Ha)	Hired Labor (Hours/Ha)	Fertilizer (Kg/Ha)	Pesticide (Cost/Ha)
<i>Land Tenure: "Inherited" Omitted</i>						
Land Rented	-51.94 [1.138]	-136.3 [0.7652]	-1104 [1.523]	-7.631 [0.1491]	-451 [2.042]**	-6.61E+04 [0.3598]
Land Used Without Pay	-18.7 [0.5106]	-21.73 [0.304]	-224.9 [0.8423]	21.51 [0.4756]	102.9 [0.9548]	628.6 [0.1787]
Land Commune Property	96.57 [1.169]	-12.36 [0.1724]	-191.3 [0.9138]	3.176 [0.01769]	116.7 [1.123]	-8317 [0.7151]
Land Purchased	-75.36 [0.6468]	-213.5 [0.808]	-1040 [1.742]*	-16.35 [0.3727]	342.2 [0.5292]	-4508 [0.7926]
Land Owned (Other)	94.97 [1.278]	47.77 [0.7156]	120.7 [0.5612]	-1.127 [0.01379]	61.49 [0.1392]	6679 [2.194]**
Spouse Controls Plot	-350.1 [3.557]***	105.2 [1.353]	-132.2 [0.9413]	-27.29 [0.1691]	201.8 [4.623]***	4.38E+04 [2.334]**
Spouse Controls X Used Without Pay	96.71 [0.9241]	-30.97 [0.4432]	43.87 [0.1265]	12.47 [0.05447]	-88.31 [1.25]	-2.08E+04 [1.057]
Spouse Controls X Commune Property	108.7 [1.209]	-103.6 [1.051]	-105.5 [0.4654]	-17.59 [0.09756]	-133.3 [2.546]**	-2.79E+04 [1.439]
Spouse Controls X Inherited	91.17 [0.6935]	-173.1 [1.267]	-312.6 [0.7797]	-17.72 [0.08676]	-49.54 [0.782]	-2.74E+04 [1.329]
Area (Hectares)	-545.3 [1.079]	-522.3 [1.155]	-1353 [1.276]	-407.9 [1.025]	63.78 [3.492]***	1.07E+04 [4.4]***
Area Squared	20.25 [0.09942]	10.41 [1.153]	109 [0.5526]	8.008 [1.006]	-5.116 [2.57]**	-1066 [2.853]***
Distance (Km)	19.99 [0.9938]	36.65 [0.7652]	191.7 [1.349]	28.56 [0.7855]	-11.17 [1.496]	1444 [0.9674]
Distance Squared	-0.3737 [0.778]	-1.158 [0.4509]	-7.813 [1.217]	-0.74 [0.7418]		-55.06 [0.6109]
Irrigated	-484.1 [1.388]	-267.3 [0.4834]			314.2 [2.134]**	
Bas Fond	-36.17 [0.3577]	79.61 [0.7375]	816.9 [0.8489]	68.3 [0.2573]	-80.31 [0.407]	-1.78E+04 [2.255]**
Observations	4197	4197	4197	4197	4197	4197
Number of FE	1404	1404	1404	1404	1404	1404

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-season-crop fixed effects.

**Table 4A: Fallow, Input Use and Gender, ICRISAT Burkina Faso 1981-83**

	Years Since Fallow	Duration Last Fallow	Animal Traction (Hours/Ha)	Manure (Kg/Ha)	Fertilizer (Kg/Ha)	Male Labor (Hours/Ha)	Female Labor (Hours/Ha)	Child Labor (Hours/Ha)	Non-HH Labor (Hours/Ha)
Female Plot	-8.18	-1.285	-741.6	-4158	-44.1	-465.8	370.7	-286.7	-266.9
Controller	[4.187]***	[1.475]	[2.503]**	[1.707]*	[2.472]**	[7.851]***	[7.494]***	[2.206]**	[1.908]*
Plot Near	18.78	-4.447	-601.7	1079	-64.03	90.94	98.95	3897	-153
Compound	[7.86]***	[2.418]***	[1.521]	[0.2754]	[2.397]**	[2.094]**	[1.885]*	[1.753]*	[1.981]**
Plot in Village	7.256	-5.898	-14.79	3175	-15.72	42.24	83.71	206.3	21.19
	[4.517]***	[5.031]***	[0.08706]	[0.8993]	[0.7672]	[1.374]	[2.392]**	[1.034]	[0.299]
Area (Hectares)	2.535	2.783	77.67	-5035	-82.73	-303.3	-248.3	-426.6	-272.3
	[1.855]*	[3.481]***	[1.474]	[0.9429]	[2.166]**	[6.544]***	[4.432]***	[1.747]*	[1.099]
Area Squared	-0.3088	-0.4132	-8.263	536.5	16.19	39.95	30.09	66.67	41.22
	[1.633]	[3.857]***	[1.315]	[0.3738]	[1.801]*	[5.009]***	[3.254]***	[1.408]	[0.9538]
Observations	2975	4619	4655	4655	4654	4655	4655	4654	4655
Number of FE	1833	2638	2649	2649	2648	2649	2649	2648	2649

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-season-crop fixed effects. All regressions include soiltype and toposequence dummies.

**Table 4B: Fallow, Input Use and Land Tenure, ICRISAT Burkina Faso 1984-85**

	Years Since Fallow	Duration Last Fallow	Hrs Labor in Land Improvement/Ha	Fertilizer (Kg/Ha)	Seed (Cost/Ha)	Non-HH Labor Payments/Ha
Own Lineage	5.83 [2.226]**	-0.9322 [0.5782]	378.4 [0.4165]	5534 [0.5973]	-149.5 [0.2869]	-35.13 [0.274]
<i>Land Tenure: "Other" (generally clearing of unclaimed land) omitted</i>						
Inherited	2.341 [0.6553]	-3.18 [0.5819]	792.9 [1.086]	4.16E+04 [0.9702]	7.484 [0.1537]	636.4 [2.433]**
Borrowed	-0.8978 [0.2304]	-3.551 [0.6467]	851.3 [1.122]	4.93E+04 [1.036]	-121 [0.2263]	
Female Plot Controller	-0.9103 [0.4392]	-3.231 [2.21]**	716 [0.6325]	9.35E+03 [0.7889]	-108 [0.2083]	-233.8 [0.8478]
Female Plot Controller X Borrowed	2.041 [0.9813]	1.448 [1.175]	-139.4 [1.054]	-1.15E+04 [0.9933]	89.93 [0.1721]	
Female Plot Controller X Own Lineage	-1.85 [0.9088]	0.838 [0.5681]	-585.5 [0.5273]	5.01E+03 [0.3956]	108.7 [0.2159]	-1349 [2.72]***
Area (Hectares)	0.2655 [0.2746]	0.5443 [0.5229]	-145.3 [0.3057]	-2.69E+04 [1.146]	-79.05 [2]**	-344 [1.089]
Area Squared	0.04228 [0.328]	-0.05648 [0.3089]	37.72 [0.2682]	6.99E+03 [1.111]	16.34 [1.777]*	58.92 [1.022]
Plot Near Compound	17.91 [8.553]***	3.706 [2.034]**	147.5 [0.8538]	1.03E+04 [1.772]*	-8.235 [0.4132]	-248.6 [0.7645]
Plot in Village	11.29 [6.329]***	-0.7524 [1.251]	223.1 [0.8405]	5645 [1.463]	-11.73 [0.5695]	-770.9 [3.002]***
Observations	3853	2817	4546	4546	4546	4546
Number of FE	1599	1195	1769	1769	1769	1769

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-season-crop fixed effects. All regressions include soiltype and toposequence dummies.

**Table 4C: Fallow, Input Use and Land Tenure, ICRISAT Burkina Faso 1984-85**

	Years Since Fallow	Duration Last Fallow	Hrs Labor in Land Improvement/Ha	Fertilizer (Kg/Ha)	Seed (Cost/Ha)	Non-HH Labor Payments/Ha
Tenure Security (1-6)	1.871 [3.305]***	-0.2938 [0.9871]	52.32 [0.439]	-2756 [1.116]	-2.063 [0.2155]	142.8 [2.564]**
Female Plot Controller	2.645 [0.9971]	-1.844 [1.128]	549.5 [0.5888]	-8.54E+03 [0.76]	-21.39 [0.4622]	158.1 [0.4083]
Female Plot Controller X Tenure Security	-0.9144 [1.829]*	-0.03819 [0.1245]	-70.89 [0.4503]	4.04E+03 [1.381]	4.194 [0.5042]	-333.4 [3.478]***
Area (Hectares)	0.2178 [0.2258]	1.025 [1.083]	-129.6 [0.4605]	-2.79E+04 [1.111]	-65.21 [2.28]**	-256.7 [0.466]
Area Squared	0.0478 [0.3736]	-0.1367 [0.823]	34.05 [0.4873]	6814 [1.168]	13.76 [1.953]*	46.51 [0.5929]
Plot Near Compound	17.61 [8.538]***	3.886 [2.117]**	126.8 [0.7654]	1.07E+04 [1.816]*	-3.998 [0.2948]	-216 [0.5052]
Plot in Village	11.31 [6.363]***	-0.6045 [1.01]	213.7 [0.8282]	5328 [1.375]	-8.878 [0.5332]	-731.5 [3.187]***
Observations	3790	2766	4477	4477	4477	4477
Number of FE	1572	1172	1742	1742	1742	1742

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-season-crop fixed effects. All regressions include soiltype and toposequence dummies.

**Table 5A: Fallow, Input Use and Land Tenure, Goldstein-Udry Ghana 1996-98**

	Last Fallow Duration	Years Since Fallow	Input Cost per Ha	Labor Cost per Ha	Seed Cost per Ha	Own Labor (Hrs) per Ha	Spouse Labor (Hrs) per Ha	Family Labor (Hrs) per Ha	Non-Family Labor (Hrs) per Ha	Total Labor (Hrs) per Ha
From Spouse	-1.455 [1.486]	1.909 [1.462]	7.72E+04 [0.004371]	2.78E+05 [0.12]	1.37E+05 [0.4714]	1.27E+03 [1.018]	-4.022 [0.00]	-782.2 [0.4982]	-381.8 [0.8465]	248.1 [0.0488]
Plot from Cultivator's Abusua	-0.1811 [0.2114]	-0.6538 [0.8955]	5.67E+05 [0.02005]	6.30E+06 [1.773]*	-2.44E+05 [0.7822]	5.17E+03 [1.902]*	2206 [0.0106]	154.1 [0.0651]	526.3 [1.131]	8197 [0.7767]
From Non-Relative	-0.8957 [0.8787]	-1.231 [1.235]	-7.85E+05 [0.1598]	-5.38E+05 [0.1623]	-3.00E+05 [1.117]	-1.33E+03 [0.3213]	-1829 [0.006]	1870 [3.347]***	550.9 [0.5919]	-2881 [0.116]
Sharecropped or Cash Payment	1.725 [1.711]*	0.6298 [0.6979]	1.34E+05 [0.007031]	1.41E+06 [0.4055]	7.97E+04 [0.2584]	3.02E+03 [0.6578]	2920 [0.01127]	-1046 [1.123]	-335.4 [0.3965]	4251 [0.1882]
Tenure (Years)	0.0009794 [0.02603]	0.04375 [1.287]	-3365 [0.007318]	-2014 [0.04483]	-3872 [0.3871]	28.24 [0.9539]	20.73 [0.03283]	37.69 [0.5715]	4.898 [0.383]	18.25 [0.1051]
Female	-1.066 [0.8761]	0.9454 [0.8655]	-2.72E+06 [0.4327]	-5.56E+06 [1.465]	-1.55E+06 [2.634]***	-4.98E+03 [2.381]**	-3340 [0.1062]	4882 [1.44]	-835.4 [1.494]	-7276 [1.229]
Office Holder	0.8631 [0.2945]	3.903 [1.119]	-3.24E+06 [0.1117]	5.38E+06 [0.5471]	-2.58E+06 [2.063]**	6.68E+03 [1.38]	2485 [0.2817]	5139 [1.874]*	-278.5 [0.3001]	8858 [0.9283]
Office X Abusa	10.78 [1.882]*	17.19 [1.283]	-7.97E+05 [0.01192]	-2.43E+07 [1.687]*		-2.30E+04 [2.071]**	-2.52E+04 [0.04433]	-5449 [0.6496]	-812.6 [0.3937]	-3.49E+04 [0.06971]
Area (Ha)	-1.515 [0.6226]	-3.313 [0.746]	-4.01E+06 [0.04226]	-3.42E+07 [2.2]**	-2.56E+05 [0.22]	-3.10E+04 [2.239]**	-2.34E+04 [0.1233]	-1.21E+04 [1.188]	-1869 [2.119]**	-4.62E+04 [0.6546]
Area (Squared)	0.1227 [0.07826]	0.06693 [0.01782]	1.24E+06 [0.02063]	1.50E+07 [1.951]*	-9.99E+05 [0.9861]	1.38E+04 [2.014]**	1.34E+04 [0.06037]	5012 [1.189]	594 [1.233]	2.09E+04 [0.152]
Observations	365	270	408	408	225	408	408	408	408	408
Number of FE	223	179	244	244	168	244	244	244	244	244

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH-crop fixed effects. All regressions include soiltype and toposequence dummies.



**Table 5B: Fallow, Input Use and Land Tenure, Goldstein-Udry Ghana 1996-98**

	Last Fallow Duration	Years Since Fallow	Labor Cost per Ha	Seed Cost per Ha	Own Labor (Hrs) per Ha	Total Labor (Hrs) per Ha
Sum of Rights	0.209 [0.87]	0.242 [1.12]	9.23E+04 [0.97]	6.36E+04 [1.33]	65.978 [0.80]	131.514 [0.90]
Female	-1.155 [2.42]**	-0.489 [1.28]	-4.56E+04 [0.24]	-1.05E+05 [0.75]	-36.571 [0.22]	36.866 [0.13]
Office Holder	-0.388 [0.46]	-0.105 [0.16]	-7.73E+04 [0.24]	-1.85E+05 [0.92]	-27.744 [0.10]	-45.069 [0.09]
Office X Abusa	1.266 [1.20]	-1.118 [1.15]	-4.05E+05 [0.99]	-2.80E+05 [0.95]	-304.167 [0.86]	-692.148 [1.11]
Area (Ha)	-1.957 [1.11]	-4.05 [2.52]**	-3.24E+06 [5.02]***	-7.22E+05 [1.44]	-2.40E+03 [4.30]***	-4.64E+03 [4.71]***
Area (Squared)	1.376 [0.99]	3.485 [2.50]**	1.71E+06 [3.46]***	2.65E+05 [0.72]	1.27E+03 [2.97]***	2.49E+03 [3.30]***
Observations	332	236	379	168	379	379
Number of FE	80	55	93	42	93	93
Cragg-Donald F	8	4.85	8.96	7.8	8.96	8.96
Sargan Test	11.42	11.23	0.27	1.17	0.43	0.88
Sargan p	0.02	0.02	0.99	0.88	0.98	0.93

Notes: Absolute value of z statistics in brackets. All regressions done using IV with HH-crop fixed effects. All regressions include soiltype and toposequence dummies.

**Table 6: Fallowing and Land Tenure, Udry Nigeria (Zaria) 1988-89**

	Proportion Fallow
Owned	0.8333 [1.976]**
Fadama	0.436 [1.357]
Fadama X Owned	-0.7074 [1.82]*
Area	-0.2717 [1.647]
Area Squared	0.01 [1.728]*
Observations	399
Number of FE	198

Notes: Absolute value of t statistics in brackets. All regressions done using Honore's tobit with HH fixed effects.

**Table 7A: Land Improvement, Input Use and Land Tenure, Ghana (Anloga) 1988**

	New Drainage	New Manuring	New Excavation	New Irrigation	New Mulching	New Shallot Beds
<i>Endogenous:</i>						
Rights With Approval	-0.278 [1.34]	-0.01 [0.10]	-0.362 [1.38]	0.272 [1.29]	-0.072 [0.39]	0.15 [0.97]
Rights Without Approval	-0.197 [1.24]	0.013 [0.17]	-0.292 [1.45]	0.247 [1.53]	-0.142 [1.00]	0.091 [0.77]
<i>Exogenous:</i>						
Average Age	-0.009 [2.44]**	0.002 [1.10]	0.001 [0.18]	0.003 [0.82]	0 [0.05]	-0.003 [1.20]
Value of Durables	0 [0.38]	0 [0.14]	0 [2.82]***	0 [1.20]	0 [0.95]	0 [0.71]
Value of Livestock	0 [1.01]	0 [0.33]	0 [0.74]	0 [0.21]	0 [0.01]	0 [0.14]
Father's Education	-0.009 [0.21]	0.009 [0.45]	0.063 [1.16]	-0.01 [0.24]	-0.028 [0.75]	0.071 [2.26]**
Women	0.027 [1.09]	-0.008 [0.69]	0.046 [1.48]	-0.022 [0.89]	0.029 [1.31]	0.009 [0.50]
Men	0.012 [0.68]	0.013 [1.54]	0.029 [1.31]	-0.002 [0.10]	-0.002 [0.11]	-0.004 [0.32]
Rooms	0.015 [1.51]	-0.004 [0.89]	0.015 [1.17]	0.008 [0.80]	0.011 [1.24]	0.017 [2.33]**
Existing Fencing	0.579 [0.75]	0.233 [0.63]	0.887 [0.91]	-0.075 [0.10]	-0.041 [0.06]	-0.09 [0.16]
Existing Drainage	0.807 [5.10]***	0.015 [0.20]	0.092 [0.46]	-0.552 [3.45]***	0.369 [2.62]***	0.007 [0.06]
Existing Tree Crops	-0.358 [2.32]**	-0.281 [3.79]***	0.738 [3.78]***	0.216 [1.38]	-0.237 [1.72]*	0.088 [0.77]
Existing Access Road	1.115 [1.87]*	0.184 [0.64]	1.053 [1.40]	-1.158 [1.92]*	0.042 [0.08]	0.165 [0.37]
Existing Manuring	-0.152 [1.46]	0.05 [0.99]	-0.358 [2.72]***	0.137 [1.30]	-0.17 [1.83]*	-0.036 [0.46]
Existing Excavation	-0.057 [0.83]	-0.054 [1.62]	0.385 [4.40]***	0.025 [0.35]	0.049 [0.80]	-0.08 [1.55]
Existing Irrigation	0.059 [0.90]	0.032 [1.02]	0.139 [1.68]*	-0.262 [3.96]***	0.058 [0.99]	0.007 [0.14]
Existing Mulching	0.278 [1.20]	0.057 [0.51]	0.49 [1.67]*	-0.277 [1.18]	0.706 [3.41]***	0.075 [0.43]
Existing Shallot Beds Area	-0.045 [0.74]	-0.01 [0.33]	0.13 [1.67]*	-0.135 [2.16]**	-0.03 [0.55]	-0.061 [1.33]
Distance from HH	-0.325 [1.28]	0.115 [0.94]	-0.118 [0.37]	0.457 [1.77]*	-0.598 [2.64]***	-0.066 [0.35]
	-0.014 [0.55]	-0.009 [0.75]	-0.022 [0.66]	-0.026 [1.01]	0.073 [3.17]***	0.025 [1.29]
Cragg-Donald F	1.33	1.33	1.33	1.33	1.33	1.33
Sargan Test	2.07	1.58	0.54	3.06	2.69	1.33
Sargan p	0.36	0.45	0.76	0.22	0.26	0.51
Observations	494	494	494	494	494	494
Number of FE	5	5	5	5	5	5

Notes: Absolute value of t statistics in brackets. All regressions done using IV with village fixed effects. The excluded instruments are years of tenure and dummies for an inherited plot, lack of title, and previous litigation.

**Table 7B: Land Improvement, Input Use and Land Tenure, Ghana (Anloga) 1988**

	New Drainage	New Manuring	New Excavation	New Irrigation	New Mulching	New Shallot Beds
Inherited	0.137 [1.70]*	0.037 [0.68]	-0.043 [0.46]	-0.098 [1.12]	0.02 [0.24]	-0.049 [0.56]
Years Owned	0.001 [0.57]	0.001 [1.19]	-0.002 [1.05]	0.001 [1.04]	-0.004 [3.00]***	-0.001 [0.49]
No Title Deed	-0.131 [2.12]**	-0.014 [0.32]	-0.134 [1.86]*	0.113 [1.69]*	-0.009 [0.14]	0.069 [1.04]
Ever Litigated	-0.09 [1.30]	-0.023 [0.50]	0.016 [0.20]	0.193 [2.56]**	0.104 [1.44]	-0.054 [0.72]
Average Age	-0.009 [2.44]**	0.002 [1.10]	0.001 [0.18]	0.003 [0.82]	0 [0.05]	-0.003 [1.20]
Value of Durables	0 [0.38]	0 [0.14]	0 [2.82]***	0 [1.20]	0 [0.95]	0 [0.71]
Value of Livestock	0 [1.01]	0 [0.33]	0 [0.74]	0 [0.21]	0 [0.01]	0 [0.14]
Father's Education	-0.009 [0.21]	0.009 [0.45]	0.063 [1.16]	-0.01 [0.24]	-0.028 [0.75]	0.071 [2.26]**
Women	0.027 [1.09]	-0.008 [0.69]	0.046 [1.48]	-0.022 [0.89]	0.029 [1.31]	0.009 [0.50]
Men	0.012 [0.68]	0.013 [1.54]	0.029 [1.31]	-0.002 [0.10]	-0.002 [0.11]	-0.004 [0.32]
Rooms	0.015 [1.51]	-0.004 [0.89]	0.015 [1.17]	0.008 [0.80]	0.011 [1.24]	0.017 [2.33]**
Existing Fencing	0.579 [0.75]	0.233 [0.63]	0.887 [0.91]	-0.075 [0.10]	-0.041 [0.06]	-0.09 [0.16]
Existing Drainage	0.807 [5.10]***	0.015 [0.20]	0.092 [0.46]	-0.552 [3.45]***	0.369 [2.62]***	0.007 [0.06]
Existing Tree Crops	-0.358 [2.32]**	-0.281 [3.79]***	0.738 [3.78]***	0.216 [1.38]	-0.237 [1.72]*	0.088 [0.77]
Existing Access Road	1.115 [1.87]*	0.184 [0.64]	1.053 [1.40]	-1.158 [1.92]*	0.042 [0.08]	0.165 [0.37]
Existing Manuring	-0.152 [1.46]	0.05 [0.99]	-0.358 [2.72]***	0.137 [1.30]	-0.17 [1.83]*	-0.036 [0.46]
Existing Excavation	-0.057 [0.83]	-0.054 [1.62]	0.385 [4.40]***	0.025 [0.35]	0.049 [0.80]	-0.08 [1.55]
Existing Irrigation	0.059 [0.90]	0.032 [1.02]	0.139 [1.68]*	-0.262 [3.96]***	0.058 [0.99]	0.007 [0.14]
Existing Mulching	0.278 [1.20]	0.057 [0.51]	0.49 [1.67]*	-0.277 [1.18]	0.706 [3.41]***	0.075 [0.43]
Existing Shallot Beds Area	-0.045 [0.74]	-0.01 [0.33]	0.13 [1.67]*	-0.135 [2.16]**	-0.03 [0.55]	-0.061 [1.33]
Distance from HH	-0.325 [1.28]	0.115 [0.94]	-0.118 [0.37]	0.457 [1.77]*	-0.598 [2.64]***	-0.066 [0.35]
	-0.014 [0.55]	-0.009 [0.75]	-0.022 [0.66]	-0.026 [1.01]	0.073 [3.17]***	0.025 [1.29]
Observations	494	494	494	494	494	494
Number of FE	5	5	5	5	5	5

Notes: Absolute value of t statistics in brackets. All regressions done using OLS with village fixed effects.

**Table 8: Land Preparation, Input Use and Land Tenure, IFPRI Ghana SN 2001**

	Used HH Labor	Used Exchange Labor	Used Manure	Used HH Waste	Used Chemical Fertilizer	Used Purchased Seed	Prepared with Tractor	Prepared with Bullock
<i>Land Tenure: "Inherited" Omitted</i>								
Leased or Borrowed	-0.102 [6.21]***	-0.081 [3.33]***	0 [0.04]	0.009 [2.33]**	-0.007 [0.26]	-0.007 [0.60]	0.043 [2.11]**	-0.025 [1.45]
Plot Controller Female	-0.118 [6.50]***	-0.256 [9.54]***	-0.008 [0.74]	-0.001 [0.14]	0.014 [0.47]	0.019 [1.56]	0.008 [0.36]	0.045 [2.41]**
Female x Leased or Borrowed	0.114 [4.41]***	-0.016 [0.42]	0.011 [0.72]	-0.008 [1.28]	-0.058 [1.38]	-0.008 [0.46]	0.021 [0.65]	-0.013 [0.47]
Area (Ha)	0.025 [4.39]***	0.065 [7.70]***	0.007 [2.15]**	0.001 [0.76]	-0.006 [0.67]	-0.004 [1.08]	0.049 [6.95]***	-0.018 [3.09]***
Area Squared	-0.001 [3.14]***	-0.002 [5.17]***	0 [1.18]	0 [0.54]	0 [0.30]	0 [0.63]	-0.002 [4.83]***	0.001 [2.11]**
Plot irrigated?	0.085 [1.38]	0.114 [1.25]	0.045 [1.29]	0 [0.02]	0.129 [1.28]	-0.007 [0.17]	0.013 [0.17]	-0.024 [0.38]
Single Cropping	-0.007 [0.61]	-0.029 [1.61]	0.009 [1.25]	0.001 [0.46]	-0.023 [1.14]	-0.006 [0.70]	-0.004 [0.25]	0.013 [1.01]
Hedging	0.047 [3.60]***	0.002 [0.08]	0.004 [0.49]	-0.001 [0.32]	0.027 [1.25]	-0.016 [1.72]*	-0.004 [0.22]	0.01 [0.74]
Observations	8559	8559	8559	8559	8559	8559	8559	8559
Number of FE	5239	5239	5239	5239	5239	5239	5239	5239

Notes: Absolute value of t statistics in brackets. All regressions done using OLS with HH-Crop fixed effects.

**Table 9: Tree Planting and Land Tenure, Ghana LSS 1989-90**

	Planted Trees	Planted Trees	Planted Trees	Planted Trees	Planted Trees
	All Plots			Owned Plots	
<i>Land Tenure: "Used Free of Charge" Omitted</i>					
Owned	0.021 [1.93]*	0.038 [2.87]***			
Owned with Deed			0.031 [1.60]	-0.126 [3.06]***	-0.131 [2.95]***
Owned without Deed			0.042 [2.85]***		
Rented		0.007 [0.44]	0.007 [0.42]		
Sharecropped		0.053 [3.53]***	0.053 [3.49]***		
Distributed by Village/Family		0.014 [0.93]	0.014 [0.94]		
Right to Sell					0.015 [0.41]
Right to Use as Security					-0.003 [0.07]
Self-Reported Value E- 09				0.683 [1.83]*	0.684 [1.83]*
Area (Acres) E-03	1.79 [3.00]***	1.65 [2.76]***	1.667 [2.79]***	-0.458 [0.47]	-0.474 [0.48]
Area Squared E-06	-17.49 [4.01]***	-16.654 [3.81]***	-16.714 [3.82]***	-7.879 [1.30]	-7.794 [1.28]
Existing Trees	0.147 [23.18]***	0.145 [22.79]***	0.145 [22.79]***	0.167 [15.33]***	0.167 [15.32]***
Observations	15772	15772	15772	5724	5724
Number of FE	6988	6988	6988	2767	2767

Notes: Absolute value of t statistics in brackets. All regressions done using OLS with HH-year fixed effects.

**Table 10: Land Exploitation and Land Tenure, Mali ZLH 1987-88**

	Not Fully Exploited	Lacked Rain	Lacked Flood	Lacked Labor	Lacked Seeds	Lacked Funds	Other Reason
<i>Land Tenure: "Inherited" Omitted</i>							
Sharecropped	-0.108 [1.67]*	0.018 [0.46]	-0.04 [0.85]	-0.004 [0.17]	0.025 [0.99]	-0.106 [2.97]***	0 [0.05]
Gifted	-0.178 [4.89]***	0.046 [2.06]**	-0.141 [5.24]***	-0.0409 [2.75]***	-0.018 [1.28]	-0.025 [1.22]	0.001 [0.13]
Municipal	-0.131 [2.59]***	-0.001 [0.03]	-0.054 [1.44]	-0.045214 [2.20]**	-0.026 [1.31]	-0.008 [0.27]	0.003 [0.40]
Plot Controller Female	-0.09 [1.69]*	-0.045 [1.38]	-0.018 [0.47]	-0.036 [1.65]*	0.002 [0.10]	0.004 [0.14]	0.003 [0.39]
Observations	1860	1860	1860	1860	1860	1860	1860
Number of FE	722	722	722	722	722	722	722

Notes: Absolute value of t statistics in brackets. All regressions done using OLS with HH-Round fixed effects. All regressions also control for a quadratic in plot area and distance, the water source of the plot, and self-reported pest severity and plot fertility.

**Table 11A: Fallow, Labor, Input Use and Land Tenure, Ghana LSS 1987-88**

	Prop. Fallow	Amount Spent on Fertilizer per Acre	Amount Spent on Insecticide per Acre	Labor Payments: Total per Acre	Rental Payments: Equipment per Acre	Prop. Young Cocoa	Prop. Oil Palm	Prop. Young Plantain
Sum of Rights	0.095 [10.13]***	144.44 [3.89]***	135.358 [3.84]***	152.373 [3.45]***	246.973 [3.02]***	0.086 [4.66]***	0.116 [8.11]***	0.039 [3.37]***
Prop. Acquired (Not Govt, Lease or SC)	-0.863 [7.66]***	-126.983 [0.43]	-52.516 [0.15]	-72.699 [0.21]	-548.511 [0.89]	-0.312 [1.24]	-0.375 [2.21]**	-0.128 [1.18]
Prop. Acquired from Govt	-0.394 [2.58]***	1.35E+03 [3.35]***	428.878 [0.91]	340.015 [0.56]	1.97E+03 [2.27]**	-0.843 [1.73]*	-1.249 [2.87]***	-0.602 [2.77]***
Prop. Rented or Sharecropped	-0.702 [12.32]***	166.946 [0.95]	222.537 [1.42]	38.885 [0.20]	224.408 [0.59]	0.082 [1.01]	-0.097 [1.51]	-0.014 [0.29]
Prop. Land in Govt Scheme	-0.209 [1.21]	1.20E+03 [2.67]***	1,154.34 [2.41]**	997.03 [1.30]	1.99E+03 [2.35]**	0.107 [0.25]	-0.382 [1.11]	-0.228 [0.82]
Total Land (Acres)	0.001 [11.92]***	-0.503 [1.48]	0.064 [0.23]	-1.424 [3.72]***	-0.426 [0.58]	0.001 [5.59]***	0 [2.12]**	0 [1.41]
Total Land Squared	0 [7.77]***	0 [1.24]	0 [0.09]	0.001 [2.45]**	0 [0.12]	0 [4.00]***	0 [1.99]**	0 [0.55]
Prop. Land Irrigated	0.018 [0.11]	935.667 [2.03]**	1.24E+03 [2.52]**	-1.33E+03 [1.45]	-890.313 [0.64]	-1.069 [1.02]	-0.336 [0.93]	0.348 [1.69]*
Observations	3533	3533	3533	3533	3533	3533	3533	3533

Notes: Absolute value of t statistics in brackets. All regressions done using tobit. Additional controls not reported: Regional fixed effects (10 regions), year dummy, proportion of land planted to mature trees (11 tree species), head's age, age squared, years education, gender, literacy, head married, head born outside village, head's language, head's religion, housing size, value of livestock, durables and equipment owned by the household, number of tools owned, remittances in and out, household's other income, household's net savings, dummy if household owns its housing, number of men, women and children, head's mother and father's educations, whether they are living, and whether they live in the household.



**Table 11B: Fallow, Labor, Input Use and Land Tenure, Ghana LSS 1987-88**

	Prop. Fallow	Amount Spent on Fertilizer per Acre	Amount Spent on Insecticide per Acre	Labor Payments: Total per Acre	Rental Payments: Equipment per Acre	Prop. Young Cocoa	Prop. Oil Palm	Prop. Young Plantain	First Stage: Sum of Rights	
Sum of Rights	2.158 [4.74]***	-532.524 [1.19]	-371.953 [0.79]	81.24 [0.16]	-317.383 [0.34]	0.181 [0.62]	0.838 [3.10]***	0.314 [1.93]*	-0.502 [3.91]***	<i>Excluded:</i> Prop. Acquired (Not Govt, Lease or SC)
Prop. Land in Govt Scheme	-1.185 [1.67]*	1.64E+03 [3.13]***	1.43E+03 [2.64]***	1.06E+03 [1.32]	2.38E+03 [2.48]**	0.064 [0.14]	-0.746 [1.74]*	-0.367 [1.22]	-0.439 [1.86]*	Prop. Acquired from Govt
Total Land (Acres)	-0.001 [1.83]*	0.131 [0.24]	0.541 [1.00]	-1.357 [2.15]**	0.077 [0.07]	0.001 [2.39]**	0 [1.50]	0 [2.12]**	-0.223 [2.95]***	Prop. Rented or Sharecropped
Total Land Squared	0 [1.46]	0 [0.03]	0 [0.82]	0 [1.77]*	0 [0.41]	0 [2.57]**	0 [1.04]	0 [1.53]		
Prop. Land Irrigated	1.181 [1.77]*	577.479 [1.05]	965.121 [1.69]*	-1.36E+03 [1.40]	-1.14E+03 [0.77]	-1.051 [0.99]	0.047 [0.11]	0.495 [2.08]**		
Minimum Distance	3.39	8.65	1.5	0.38	5.93	5.42	4.61	5.33	8.54	F-Statistic on Excluded Instruments
p	0.18	0.01	0.47	0.83	0.05	0.07	0.1	0.07		
Observations	3533	3533	3533	3533	3533	3533	3533	3533		

Notes: Absolute value of t statistics in brackets. All regressions done using Newey's IV tobit. Additional controls not reported: Regional fixed effects (10 regions), year dummy, proportion of land planted to mature trees (11 tree species), head's age, age squared, years education, gender, literacy, head married, head born outside village, head's language, head's religion, housing size, value of livestock, durables and equipment owned by the household, number of tools owned, remittances in and out, household's other income, household's net savings, dummy if household owns its housing, number of men, women and children, head's mother and father's educations, whether they are living, and whether they live in the household.

**Table 12A: Fallow, Labor, Input Use and Land Tenure, Ivory Coast LSMS 1985-88**

	Proportion Fallow	Seed/Ha	Fertilizer/Ha	Insecticide/Ha	Paid Labor/Ha	Prop. Young Cocoa	Prop. Young Coffee
Sum of Rights	0.054 [5.52]***	-505.248 [1.15]	481.969 [1.19]	90.737 [0.80]	-1.02E+03 [1.69]*	0.012 [0.86]	0.011 [0.57]
Bought Land	0.023 [0.44]	418.425 [0.20]	-520.166 [0.26]	258.988 [0.52]	1.56E+03 [0.51]	0.056 [0.95]	-0.092 [0.99]
Paid to Use Land	-0.046 [1.49]	-192.438 [0.15]	1.23E+03 [1.08]	412.794 [1.23]	3.39E+03 [1.89]*	-0.046 [1.13]	0.06 [1.14]
Received Gift of Land	-0.014 [0.53]	2.98E+03 [2.71]***	805.895 [0.80]	-183.815 [0.60]	858.746 [0.55]	-0.013 [0.37]	0.049 [1.02]
Sharecropper	-0.107 [2.47]**	-3.36E+03 [1.82]*	-4.11E+03 [1.91]*	-302.356 [0.63]	-6.12E+03 [2.32]**	-0.077 [1.45]	-0.038 [0.51]
Proportion of Land in Co-op	-0.242 [3.88]***	-4.27E+03 [1.38]	-3.51E+03 [1.48]	-290.666 [0.49]	-43.599 [0.01]	0.145 [2.05]**	0.062 [0.56]
Proportion of Land in Development Scheme	-0.095 [1.60]	488.941 [0.23]	-1.55E+04 [1.38]	493.853 [0.88]	2,249.42 [0.71]	0.084 [1.33]	0.011 [0.12]
Land per Person	0.014 [5.67]***	157.816 [1.54]	96.816 [0.99]	22.759 [1.00]	74.26 [0.54]	0.007 [1.78]*	-0.004 [0.50]
Total Land	0.018 [21.12]***	-148.08 [3.54]***	-12.948 [0.42]	2.088 [0.25]	-0.133 [0.00]	0.004 [3.19]***	0.011 [3.71]***
Total Land Squared	0 [15.07]***	0.245 [2.18]**	-0.021 [0.14]	0.007 [0.34]	0.012 [0.10]	0 [3.28]***	0 [2.84]***
Observations	2473	2473	2473	2473	2473	2473	2473

Notes: Absolute value of t statistics in brackets. All regressions done using tobit. Additional controls not reported: Year and rainfall station dummies, proportion of land planted to mature trees (9 tree species), head's age, age squared, years education, gender, literacy, head married, head born outside village, head non-Ivorian, head's ethnicity, head's religion, housing size, value of livestock, durables and equipment owned by the household, number of tools owned, remittances in and out, household's other income, household's savings, dummy if household owns its housing, number of rooms, household size, number of adults, head's mother and father's educations, whether they are living, and whether they live in the household.

**Table 12B: Fallow, Labor, Input Use and Land Tenure, Ivory Coast LSMS 1985-88**

	Proportion Fallow	Seed/Ha	Fertilizer/Ha	Insecticide/Ha	Paid Labor/Ha	Prop. Young Cocoa	Prop. Young Coffee	First Stage: Sum of Rights	
Sum of Rights	0.329 [2.31]**	562.852 [0.11]	7.33E+03 [1.24]	1.52E+03 [1.05]	1.42E+04 [1.67]*	0.237 [1.44]	0.003 [0.01]	0.038 [0.36]	<i>Excluded:</i> Bought Land
Proportion of Land in Co-op	-0.341 [4.02]***	-3.85E+03 [1.07]	-5.72E+03 [1.77]*	-795.847 [1.01]	-5.06E+03 [1.06]	0.065 [0.69]	0.072 [0.55]	0.092 [1.50]	Paid to Use Land
Proportion of Land in Development Scheme	-0.045 [0.63]	574.513 [0.25]	-1.51E+04 [1.34]	729.719 [1.15]	4.69E+03 [1.19]	0.123 [1.65]*	0.007 [0.07]	-0.098 [1.80]*	Received Gift of Land
Land per Person	0.015 [5.32]***	183.688 [1.73]*	137.556 [1.28]	28.465 [1.14]	155.941 [0.97]	0.008 [1.93]*	-0.004 [0.46]	-0.299 [3.55]***	Sharecropper
Total Land	0.016 [10.90]***	-159.924 [2.72]***	-63.924 [1.14]	-8.144 [0.58]	-114.206 [1.37]	0.003 [1.42]	0.011 [3.16]***		
Total Land Squared	0 [13.00]***	0.269 [1.82]*	0.099 [0.52]	0.032 [0.98]	0.288 [1.44]	0 [2.74]***	0 [2.79]***		
Minimum Distance	5.76	10.96	2.96	1.15	2.78	3.57	3.38	4.1	F-Statistic on Excluded Instruments
p	0.12	0.01	0.4	0.77	0.43	0.31	0.34		
Observations	2473	2473	2473	2473	2473	2473	2473		

Notes: Absolute value of t statistics in brackets. All regressions done using Newey's IV tobit. Additional controls not reported: Year and rainfall station dummies, proportion of land planted to mature trees (9 tree species), head's age, age squared, years education, gender, literacy, head married, head born outside village, head non-Ivorian, head's ethnicity, head's religion, housing size, value of livestock, durables and equipment owned by the household, number of tools owned, remittances in and out, household's other income, household's savings, dummy if household owns its housing, number of rooms, household size, number of adults, head's mother and father's educations, whether they are living, and whether they live in the household.

Table 13: Meta-Data on Current Results

Dataset	Investment	ITyp	Bin	TTyp	Nvar	Sig	AvgT	MaxT	TS	Cty	Rgn	N	HFE	Pub
Benin SFS 1998	Male Labor	Inp	0	Acq	1	0	0.62	0.62	0	BJ	W	4329	1	0
	Female Labor	Inp	0	Acq	1	0	0.58	0.58	0	BJ	W	4329	1	0
	Child Labor	Inp	0	Acq	1	0	0.59	0.59	0	BJ	W	4329	1	0
	Hired Labor	Inp	0	Acq	1	0	0.74	0.74	0	BJ	W	4329	1	0
	Fertilizer	Inp	0	Acq	1	0	0.30	0.30	0	BJ	W	4329	1	0
	Pesticide	Inp	0	Acq	1	0	0.19	0.19	0	BJ	W	4329	1	0
	Male Labor	Inp	0	Acq	5	0	0.96	1.28	0	BJ	W	4197	1	0
	Female Labor	Inp	0	Acq	5	0	0.54	0.81	0	BJ	W	4197	1	0
	Child Labor	Inp	0	Acq	5	1	1.11	1.74	0	BJ	W	4197	1	0
	Hired Labor	Inp	0	Acq	5	0	0.21	0.49	0	BJ	W	4197	1	0
	Fertilizer	Inp	0	Acq	5	1	0.96	2.04	0	BJ	W	4197	1	0
	Pesticide	Inp	0	Acq	5	1	0.84	2.18	0	BJ	W	4197	1	0
ICRISAT BF 1984/85	Yrs Since Fallow	Fal	0	Acq	3	1	1.04	2.23	0	BF	W	3853	1	0
	Dur Last Fallow	Fal	0	Acq	3	0	0.60	0.65	0	BF	W	2817	1	0
	Hrs Improvement	Imp	0	Acq	3	0	0.88	1.12	0	BF	W	4546	1	0
	Fertilizer	Inp	0	Acq	3	0	0.87	1.04	0	BF	W	4546	1	0
	Seed	Inp	0	Acq	3	0	0.22	0.29	0	BF	W	4546	1	0
	Non-HH Labor	Imp	0	Acq	3	1	1.35	2.43	0	BF	W	4546	1	0
	Yrs Since Fallow	Fal	0	Acq	1	1	3.31	3.31	0	BF	W	3790	1	0
	Dur Last Fallow	Fal	0	Acq	1	0	0.99	0.99	0	BF	W	2766	1	0
	Hrs Improvement	Imp	0	Acq	1	0	0.44	0.44	0	BF	W	4477	1	0
	Fertilizer	Inp	0	Acq	1	0	1.12	1.12	0	BF	W	4477	1	0
	Seed	Inp	0	Acq	1	0	0.22	0.22	0	BF	W	4477	1	0
	Non-HH Labor	Imp	0	Acq	1	1	2.56	2.56	0	BF	W	4477	1	0

GU Ghana 1996-98	Yrs Last Fallow	Fal	0	Acq	5	1	0.86	1.71	0	GH	W	365	1	0
	Yrs Since Fallow	Fal	0	Acq	5	0	1.12	1.46	0	GH	W	270	1	0
	Input Cost	Inp	0	Acq	5	0	0.04	0.16	0	GH	W	408	1	0
	Labor Cost	Inp	0	Acq	5	1	0.50	1.77	0	GH	W	408	1	0
	Seed Cost	Inp	0	Acq	5	0	0.60	1.12	0	GH	W	225	1	0
	Own Labor	Inp	0	Acq	5	1	0.97	1.90	0	GH	W	408	1	0
	Spouse Labor	Inp	0	Acq	5	0	0.01	0.03	0	GH	W	408	1	0
	Family Labor	Inp	0	Acq	5	1	1.12	3.35	0	GH	W	408	1	0
	Non-Family Labor	Inp	0	Acq	5	0	0.67	0.25	0	GH	W	408	1	0
Total Labor	Inp	0	Acq	5	0	1.13	0.78	0	GH	W	408	1	0	
Udry Nigeria 1988-89	Yrs Last Fallow	Fal	0	Acq	1	0	0.87	0.87	0	GH	W	332	1	0
	Yrs Since Fallow	Fal	0	Acq	1	0	1.12	1.12	0	GH	W	236	1	0
	Labor Cost	Inp	0	Acq	1	0	0.97	0.97	0	GH	W	379	1	0
	Seed Cost	Inp	0	Acq	1	0	1.33	1.33	0	GH	W	168	1	0
	Own Labor	Inp	0	Acq	1	0	0.80	0.80	0	GH	W	379	1	0
	Total Labor	Inp	0	Acq	1	0	0.90	0.90	0	GH	W	379	1	0
	Prop. Fallow	Fal	0	Acq	1	1	1.98	1.98	0	NG	W	399	1	0
Ghana (Anloga) 1988	Drainage	Imp	1	Tfr	2	0	1.29	1.34	1	GH	W	494	0	0
	Manuring	Inp	1	Tfr	2	0	0.14	0.17	1	GH	W	494	0	0
	Excavation	Imp	1	Tfr	2	0	1.42	1.45	1	GH	W	494	0	0
	Irrigation	Imp	1	Tfr	2	0	1.41	1.53	1	GH	W	494	0	0
	Mulching	Inp	1	Tfr	2	0	0.70	1.00	1	GH	W	494	0	0
	Shallot Beds	Imp	1	Tfr	2	0	0.87	0.97	1	GH	W	494	0	0
	Drainage	Imp	1	Tfr	2	1	1.42	2.12	0	GH	W	494	0	0
	Manuring	Inp	1	Tfr	2	0	0.67	1.19	0	GH	W	494	0	0
	Excavation	Imp	1	Tfr	2	1	0.89	1.86	0	GH	W	494	0	0
	Irrigation	Imp	1	Tfr	2	1	1.60	2.56	0	GH	W	494	0	0
	Mulching	Inp	1	Tfr	2	1	1.21	3.00	0	GH	W	494	0	0
	Shallot Beds	Imp	1	Tfr	2	0	0.70	1.04	0	GH	W	494	0	0

IFPRI Ghana SN 2001	HH Labor	Inp	1	Acq	1	1	6.21	6.21	0	GH	W	8559	1	0
	Exch. Labor	Inp	1	Acq	1	1	3.33	3.33	0	GH	W	8559	1	0
	Manure	Inp	1	Acq	1	0	0.04	0.04	0	GH	W	8559	1	0
	HH Waste	Inp	1	Acq	1	1	2.33	2.33	0	GH	W	8559	1	0
	Chem. Fert.	Inp	1	Acq	1	0	0.26	0.26	0	GH	W	8559	1	0
	Purch. Seed	Inp	1	Acq	1	0	0.60	0.60	0	GH	W	8559	1	0
	Prep. Tractor	Imp	1	Acq	1	1	2.11	2.11	0	GH	W	8559	1	0
Prep. Bullock	Imp	1	Acq	1	0	1.45	1.45	0	GH	W	8559	1	0	
Ghana LSS 1989-90	Planted Trees	Tre	1	Acq	4	1	1.94	3.53	0	GH	W	15772	1	0
Mali ZLH 1987-88	Not Full Expl.	Fal	1	Acq	3	1	3.05	4.89	0	ML	W	1860	1	0
	Lacked Rain	Fal	1	Acq	3	1	0.85	2.06	0	ML	W	1860	1	0
	Lacked Flood	Fal	1	Acq	3	1	2.51	5.24	0	ML	W	1860	1	0
	Lacked Labor	Fal	1	Acq	3	1	1.70	2.75	0	ML	W	1860	1	0
	Lacked Seeds	Fal	1	Acq	3	0	1.19	1.31	0	ML	W	1860	1	0
	Lacked Funds	Fal	1	Acq	3	1	1.49	2.97	0	ML	W	1860	1	0
	Other Reason	Fal	1	Acq	3		0.19	0.40	0	ML	W	1860	1	0
Ghana LSS 1987-88	% Fallow	Fal	0	Mul	4	1	8.17	12.32	0	GH	W	3533	0	0
	Fertilizer	Inp	0	Mul	4	1	2.16	3.89	0	GH	W	3533	0	0
	Insecticide	Inp	0	Mul	4	1	1.58	3.84	0	GH	W	3533	0	0
	Labor	Inp	0	Mul	4	1	1.11	3.45	0	GH	W	3533	0	0
	Equipment	Inp	0	Mul	4	1	1.69	3.02	0	GH	W	3533	0	0
	% Y. Cocoa	Tre	0	Mul	4	1	2.16	4.66	0	GH	W	3533	0	0
	% Y. Palm	Tre	0	Mul	4	1	3.68	8.11	0	GH	W	3533	0	0
	% Y. Plantain	Tre	0	Mul	4	1	1.90	3.37	0	GH	W	3533	0	0
	% Fallow	Fal	0	Tfr	1	1	4.74	4.74	1	GH	W	3533	0	0
	Fertilizer	Inp	0	Tfr	1	0	1.19	1.19	1	GH	W	3533	0	0
	Insecticide	Inp	0	Tfr	1	0	0.79	0.79	1	GH	W	3533	0	0
	Labor	Inp	0	Tfr	1	0	0.16	0.16	1	GH	W	3533	0	0
	Equipment	Inp	0	Tfr	1	0	0.34	0.34	1	GH	W	3533	0	0
	% Y. Cocoa	Tre	0	Tfr	1	0	0.62	0.62	1	GH	W	3533	0	0
% Y. Palm	Tre	0	Tfr	1	1	3.10	3.10	1	GH	W	3533	0	0	
% Y. Plantain	Tre	0	Tfr	1	1	1.93	1.93	1	GH	W	3533	0	0	

	% Fallow	Fal	0	Mul	5	1	2.48	5.52	0	CI	W	2473	0	0
	Seed	Inp	0	Mul	5	0	0.50	1.15	0	CI	W	2473	0	0
	Fertilizer	Inp	0	Mul	5	0	0.84	1.19	0	CI	W	2473	0	0
	Insecticide	Inp	0	Mul	5	0	0.85	1.23	0	CI	W	2473	0	0
	Paid Labor	Inp	0	Mul	5	1	1.36	1.89	0	CI	W	2473	0	0
Iv. Cst.	% Y Cocoa	Tre	0	Mul	5	0	0.98	1.13	0	CI	W	2473	0	0
LSMS 1985-	% Y Coffee	Tre	0	Mul	5	0	0.90	1.14	0	CI	W	2473	0	0
88														
	% Fallow	Fal	0	Mul	1	1	2.31	2.31	1	CI	W	2473	0	0
	Seed	Inp	0	Mul	1	0	0.11	0.11	1	CI	W	2473	0	0
	Fertilizer	Inp	0	Mul	1	0	1.24	1.24	1	CI	W	2473	0	0
	Insecticide	Inp	0	Mul	1	0	1.05	1.05	1	CI	W	2473	0	0
	Paid Labor	Inp	0	Mul	1	1	1.67	1.67	1	CI	W	2473	0	0
	% Y Cocoa	Tre	0	Mul	1	0	1.44	1.44	1	CI	W	2473	0	0
	% Y Coffee	Tre	0	Mul	1	0	0.01	0.01	1	CI	W	2473	0	0





	<i>Inputs</i>				<i>Investments</i>			
<b>Ghana LSS 1989-90</b>	(none)				Trees			
<i>OLS</i>								
Owned					0.07 (2.96)			
Obs/FE					15772/6988			
	<i>Inputs</i>				<i>Investments</i>			
<b>Mali ZLH 1987-88</b>	(none)	Not Full Expl.	Lacked Rain	Lacked Flood	Lacked Labor	Lacked Seeds	Lacked Funds	Other Reason
<i>OLS</i>								
Owned		0.11 (3.99)	0.01 (0.47)	0.06 (2.80)	0.02 (1.78)	0.01 (1.57)	0.02 (1.50)	-0.01 (1.37)
Obs/FE		2158/778	2158/778	2158/778	2158/778	2158/778	2158/778	2158/778
	<i>Inputs</i>				<i>Investments</i>			
<b>Ghana LSS 1987-88</b>	Fertilizer	Insecticide	Labor	Equipment	% Fallow	% Y. Cocoa	% Y. Palm	% Y. Plantain
<i>Tobit</i>								
Right to Sell	-0.25 (.)	-0.05 (.)	0.03 (1.64)	-0.03 (.)	0.18 (6.97)	0.11 (.)	0.15 (.)	-0.03 (0.92)
Obs/FE	3546/326	3546/326	3546/326	3546/326	3546/326	3546/326	3546/326	3546/326
	<i>Inputs</i>				<i>Investments</i>			
<b>Iv. Cst. LSMS 1985-88</b>	Seed	Fertilizer	Insecticide	Paid Labor	% Fallow	% Y Cocoa	% Y Coffee	
<i>Tobit</i>								
Right to Sell	-0.19 (.)	-0.15 (.)	-0.09 (.)	0.02 (0.36)	0.34 (5.58)	0.05 (0.33)	0.25 (.)	
Obs/FE	2473/263	2473/263	2473/263	2473/263	2473/263	2473/263	2473/263	

Notes: T-statistics in parentheses. (.) indicates that convergence could not be achieved. If the dependent variable is continuous, coefficients are divided by the standard deviation of the dependent variable. If the land tenure variable is continuous, coefficients are multiplied by the standard deviation of the land tenure variable. Fixed effects are: Benin SFS 1998, HH-season-crop; ICRISAT Burkina Faso 1984/85, HH-season-crop; Goldstein-Udry Ghana 1996-98, HH-season-crop fixed effects; Udry Nigeria (Zaria) 1988-89, HH fixed effects; Ghana (Anloga) 1988, HH; IFPRI Ghana SN 2001, household-crop fixed effects; Ghana LSS 1989-90, HH-year; Mali ZLH 1987-88, HH-Round; Ghana LSS 1987-88, village-year; Ivory Coast LSMS 1985-88, village-year.

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## Data descriptions and summary statistics

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This section briefly describes the investment and land tenure variables available in each data-set. Summary statistics for these data sets are presented in Appendix Tables A1-A10.

**Benin SFS:** The Benin Small Farmer Survey was carried out by IFPRI and LARES in 1998, and collected data from 899 households. The sample used is restricted to plots farmed by either male household heads or their female spouses. 4329 plot-season observations are kept for the final analysis. The "investments" found in the data are generally non-permanent, and refer generally to input use. Male, female, child and hired labor is summed over tasks. Fertilizer use in the sample is almost exclusively NPK and Urea, so this is to be treated as a temporary input. Only a quarter of households use fertilizers, and less than a fifth use pesticides. More than 70% of plot-season observations in the sample are owned. More than half are owned through inheritance. After this, the most prevalent forms of tenure are use without pay, "other," and ownership through a commune. Purchase accounts for 6% of all observations.

**ICRISAT Burkina Faso Farm-Level Studies (A) and (B):** For this study, the Burkina Faso data are divided into two sections. The first, from 1981-1985, consists of data collected by the West African Economics Program of ICRISAT from approximately 150 farmers in three agroclimatic zones of Burkina Faso. The second, from 1984-1985, was collected by ICRISAT in conjunction with researchers from IFPRI and the World Bank. 4655 plot-year observations are used from the first section, and 4546 are used from the second.

In the first section of the data, questions were asked on fallowing, animal use, manure, fertilizer, and labor. The separate questions of "years since fallow" and "duration of last fallow" appear to have confused the respondents. Of the 3,060 observations for which data are available on both, the questions received the same answer approximately 40% of the time. The two measures have a positive correlation coefficient of 0.1343, while when these identical responses are removed, the correlation coefficient is -0.1116. In the 1984-85 data, this does not appear to be as much of a problem, as fewer than 5% of responses give the same values for each variable. Animal traction, fertilizer, and manure were each used by fewer than a quarter of all households. By construction, fertilizer use in these data refers to chemical fertilizers -- rock phosphate, cotton complex (NPK), and urea. The second section asks about similar investments, although it omits animal traction and manure, while adding seed inputs. Whereas data were collected from weekly interviews in 1981-83, a single end-of season interview was collected in 1984-85.

The first section of the data does not ask about land tenure, but the gender of the cultivator allows for a similar analysis to be performed as in Goldstein and Udry (2008). The second section includes three types of information on land tenure. The first is an indicator for whether original rights to the plot belong to the cultivator's lineage, i.e. the land is in the area of the village originally allotted to the cultivator's lineage. This is true for three quarters of the sample. The second, data on the identity of the plot grantor (grandfather, father, uncle, brother, cousin, maternal lineage, other lineage, or other), is not reported here. The third, on the mode of acquisition, is divided into inherited plots, borrowed plots, and "other," generally the clearing of unclaimed land. 71% of plots are inherited, and almost all others are borrowed. Matlon (1994), from conversations with farmers, constructed an ordering of plots according to their (increasing) subjective security of tenure:

1. Borrowed/On non-lineage land/From a person outside the lineage
2. Borrowed/On non-lineage land/From a person inside the lineage
3. Borrowed/On lineage land/From a person outside the lineage
4. Borrowed/On lineage land/From a person inside the lineage
5. Inherited/On non-lineage land/From a person outside the lineage
6. Inherited/On lineage land/From a person inside the lineage

I have constructed the variable "Tenure Security," coded 1-6, to correspond with these rankings. It is used as an alternative measure of land tenure in the analysis.

**Goldstein-Udry Ghana Survey:** The Goldstein-Udry Ghana Survey collected data from 240 married couples over two years in the Akwapim South District of the Eastern Region of Ghana. Although there is at least some data collected on 1843 plots, area is only available for 953, and many other observations are missing. The questionnaire asked about fallowing, cost of inputs, labor, and seeds. I have not used chemical inputs in the estimation. The land tenure variables are not a list of mutually exclusive and exhaustive categories. More than half of all plots come from within the same matrilineage (abusa) as the cultivator, nearly 30% come from a non-relative, and 35% are obtained in commercial transactions. Only an eighth of plots can be sold by their cultivators, and though the rights to pledge, mortgage, rent and lease are more common, none of these exceed 25%. These rights are summed for the econometric analysis.

**Udry Nigeria (Zaria) Survey:** The Udry Nigeria (Zaria) Survey was not collected in order to study agriculture, but rather to investigate credit and insurance markets; see Udry (1995) and Udry (1994) for references. As part of the survey, the 198 households sampled were asked about their holdings of gona and fadama land, owned and borrowed, both fallow and in use. These data allow the proportion of each type of land currently kept fallow to be used as a proxy for the ratio of the length of fallow to the length of cultivation. Nearly 85% of households own some land, and more than half borrow some. 16% of households have some land currently fallow. 399 "artificial plots" were constructed from these data; of these, nearly two thirds are owned, while fewer than 10% have any proportion fallow.

**World Bank Ghana Survey (Anloga Section):** The World Bank data collected from the Anloga region of Ghana were gathered as part of a larger project, and are described by Migot-Adholla et al. (1991). They characterize Anloga as a "highly commercialized shallot growing region with a dense, homogeneous population." In the sample used by Besley (1995), 494 plots belonging to 151 households are retained for the analysis. Summary statistics presented here are identical to those in Besley (1995), excepting that he finds a greater proportion of households are able to bequeath their lands, which raises the summation measures of land rights slightly. Investments studied are new drainage, manuring, excavation, irrigation, mulching and making shallot beds. The individualization of land rights in the area is evident from the high proportions of plots over which alienation rights are held. Inheritance is clearly the most common means of acquiring land, and so identification in the instrumental-variables approach is largely due to the history of litigation, possession of a title deed, and years of ownership.

**IFPRI Ghana SN:** The 2001 survey of the Northern Savelugu and Nanton regions of Ghana was conducted by IFPRI in collaboration with the Food and Nutrition Security Unit at the University for Development Studies. The Savelugu/Nanton Household Survey data have been made available by the International Food Policy Research Institute (IFPRI), the University for Development Studies (UDS), and UNICEF--Ghana. Funding for data collection was provided by UNICEF--Ghana and IFPRI. The preparation of the publicly released version of these data was supported, in part, by the World Bank and IFPRI. UNICEF--Ghana, IFPRI, and the World Bank are not responsible for any errors in these data or for their use or interpretation. In the final analysis, 8559 plots from 1539 households were used. The survey asked a series of yes/no questions about labor, input use, and land preparation. Green manure was dropped from the analysis due to insufficient positive observations. The excluded form of land preparation is by hoe. In the sample, nearly three quarters of plots are held by inheritance, while the remainder are leased or borrowed (these were not recorded as separate categories). 1% of plots were held under other forms of tenure -- rental, "village/community," "family," private purchase, gift, and "other." These are not used in the analysis.

**Ghana LSS (A) and (B):** The Ghana Living Standards Survey is part of the World Bank's set of Livings Standards Measurement Studies. For the purpose of this analysis, I have broken the survey into two components; the first is the plot-level data from 1989 and 1990, and the second is the household survey from 1987 and 1988. Because the household identifiers are not consistent across years, these are treated as repeated cross-sections and not as a panel. 3546 "households" are retained for the first sample, and 15778 plots from 6991 household-years are used in the second.

The first data set, covering plots, does not explicitly ask about investment, but does ask farmers what crops they planted in the past year. This allows tree planting to be used as a measure of investment. Nearly 40% of plots in the sample are "owned" (whether these are inherited or purchased is not given), while distribution by the village or family and use "free of charge" are the next most important modes of acquisition. Of owned plots, a little over a fifth are owned with a deed. Rights to sell or use as security were only asked for owned plots; close to two thirds of owned plots are reported to be saleable, and a similar fraction are usable as collateral.

The variables used from the household survey are generally proxies for the variables collected in other plot-level data. Households were asked how much land owned by the household was under cultivation (including land rented out or sharecropped), how many acres of fallow land were available, and how many acres they had acquired in the past twelve months through non-government sources, from the government, and through sharecropping or rental. The sum of these is taken as the household's total land. Fallow and land sharecropped or rented out are subtracted to derive the land cultivated by the household. Households for which this derived measure of cultivated land was zero or negative are dropped. Fallow is treated as an investment, by dividing the area fallow by total land, to give "proportion fallow," a proxy for the ratio of fallow length to cultivation length. Households were asked about their fertilizer, insecticide, labor payments and equipment rentals for each crop cultivated. These are summed over all crops and divided by the land cultivated to give per-acre input use.

Households were also asked how many acres they harvested of various tree crops, and how many acres were not yet in production. The sum of these is treated as the acreage planted for each tree crop. They were also asked what proportion of their trees were too young to produce, mature, and nearing the end of their productive life. The proportion of young trees was multiplied by the acreage planted and divided by land under cultivation to create variables such as "proportion of young cocoa," which are treated as proxies for recent investment in tree planting. The similarly constructed sum of mature and old proportions are used as the proportion the tree crop "standing," a proxy for past tree planting. Standing trees of all species are used as explanatory variables, but only the three most important tree species -- cocoa, oil palm, and plantain -- are treated as investments. All proportions are top-coded at 1.

Households were asked whether they were permitted to sell land with or without approval, and whether they could lease, rent or sharecrop out their land. Following Besley (1995), the sum of sharecropping and sale rights are used in the econometric analysis. There are no questions asked in the data about land acquisition that serve as good proxies for the instruments used in plot level data. The closest equivalents ask if the household has acquired any land in the past year through non-governmental sources, through the government, or through sharecropping, lease or rental. Fewer than three percent of households acquired land by each of the first two methods, and approximately one eighth held some land under the third. Each of these forms a very small proportion of total land.

**IFPRI Mali ZLH:** The Mali Zone Lacustre Household data set is a four round survey of 275 households collected in 1997 and 1998. These data, originally collected by Luc Christiaensen with support from John Hoddinott have been made available by the International Food Policy Research Institute. Funding for data collection was provided by the International Fund for Agricultural Development (TA Grant No. 301-IFPRI) and USAID/Mali (TA Grant No. 301-IFPRI). Neither IFAD nor USAID are responsible for any errors in these data or in their interpretation. These data could not have been collected without the substantial assistance of Sidi Guindo, Abdourhamane Maiga and Mamadou Nadio, and the helpful cooperation of the residents of the Zone Lacustre. 2228 plot-round observations, corresponding to 268 households and 802 household-rounds are retained for the analysis. Although the survey asked respondents about their use of inputs such as seed and manure, these data were not collected at the plot level, but rather for "all female plots" and "all male plots" within a household in a given round. These are not used.

The only measure of "investment" in the plot-level data, then, is an indicator for whether the plot was fully exploited in a given round, and if not, why not. This should be a useful measure of the impact of land tenure. If modes of land acquisition are correlated with lack of cultivation due to exogenous whether shocks -- here, rain and flood -- then they reflect the insecurity with which plots are held. If adverse weather makes cultivation unprofitable, but the plot is exploited anyways, this is evidence of a fear the land will be lost if not used. If, conversely, land is not cultivated due to a lack of inputs (labor, seeds, or funds), this may be evidence either of diverting resources away from insecurely held plots or the importance of land tenure in providing access to credit. The vast majority of plots in the sample are held via inheritance, with gift and ownership by the municipality as the next most prevalent tenures. Conversion factors for the area measures "sombouy," "lot," and "other" were not included in the data, and plots measured in these units were not used in the analysis.

**Ivory Coast LSMS:** The Ivory Coast LSMS data are collected on the same format as the household survey portion of the Ghana LSS. Half the sample in any given year is re-sampled in the previous year. Since the rights variables in this data are generally invariant over time, and to avoid giving re-sampled households undue weight in the results, if a household appears twice, only the first observation is kept. 2476 households are retained for the analysis.

As in the Ghana LSS data, the variables used from the household survey are rough proxies for variables used in other plot-level studies. Households were asked how much land was under cultivation and how many acres of fallow land were available. The former is taken as the land cultivated by the household, and the sum of these is taken as the household's total land. "Proportion fallow" is calculated as in the GLSS, with a similar interpretation. Fertilizer, insecticide, and labor payments are treated as in the GLSS. The proportions of cultivated land under young trees are again taken as proxies for tree planting, and the species studied here are the two most prevalent -- coffee and cocoa. All proportions are again top-coded at 1. Households were asked whether they had the rights to sell or transfer their land. While approximately 60% reported having transfer rights, a little under half claimed that they could sell their land. Following Besley (1995), the sum of these rights is used in the econometric analysis. As in the GLSS, households are not asked how they acquired their current landholdings, but rather whether in the past twelve months they bought land, paid to use it, received it as a gift, gave it as a gift, or sharecropped. None of these exceed 10% of the sample.

**Table A1: Summary Statistics, Benin SFS 1988**

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	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures</i>						
Male Labor (Hours/Ha)	4329	84.48	253.07	0	7425.47	0.18
Female Labor (Hours/Ha)	4329	48.26	169.09	0	7154.47	0.30
Child Labor (Hours/Ha)	4329	33.99	192.22	0	7181.57	0.53
Hired Labor (Hours/Ha)	4329	43.11	204.34	0	7520.33	0.46
Fertilizer (Kg/Ha)	4329	56.76	193.14	0	6400	0.76
Pesticide (Cost/Ha)	4329	4040.8	12878.58	0	2.60E+05	0.82
<i>Land Tenure and Control</i>						
Land Owned	4329	0.71	0.45	0	1	
Land Sharecropped	4329	0.01	0.08	0	1	
Land Rented	4329	0.06	0.24	0	1	
Land Used without Pay	4329	0.12	0.33	0	1	
Land Commune Property	4329	0.08	0.28	0	1	
Land Unowned (Other)	4329	0.02	0.13	0	1	
Land Inherited	4329	0.54	0.5	0	1	
Land Allocated	4329	0.00	0.07	0	1	
Land Purchased	4329	0.06	0.24	0	1	
Land From Government	4329	0.00	0.03	0	1	
Land Owned (Other)	4329	0.10	0.3	0	1	

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**Table A2: Summary Statistics, ICRISAT Burkina Faso 1981-1985**

	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures, 1981-1983</i>						
Years Since Fallow	3063	9.43	15.34	0	99	43.45
Duration of Last Fallow	4750	2.54	5.72	0	70	68.48
Animal (Hours/Ha)	4655	21.55	147.47	0	5028.96	73.23
Manure (Kg/Ha)	4787	2137.29	9412.23	0	1.63E+05	78.75
Fertilizer (Kg/Ha)	4654	17.96	66.84	0	1209.43	75.42
Male Labor (Hours/Ha)	4655	426.69	903.2	0	15612.5	15.79
Female Labor (Hours/Ha)	4655	466.18	826.74	0	13772.73	9.86
Child Labor (Hours/Ha)	4654	157.92	1020.49	0	32727.27	56.85
Non-HH Labor (Hours/Ha)	4655	84.87	345.56	0	11891.42	60.19
<i>Land Tenure and Control, 1981-1983</i>						
Female Plot Controller	4787	0.36	0.48	0	1	
<i>Investment Measures, 1984-1985</i>						
Years Since Fallow	3870	11.73	16.45	0	87	23.26
Duration of Last Fallow	2832	8.93	10.63	0	80	0.25
Hrs Labor in Land Improvement/Ha	4546	48.01	289.9	0	13142.86	67.66
Fertilizer/Ha	4546	1588.78	7399.86	0	2.06E+05	75.67
Seed/Ha	4546	112.18	568.99	0	14031.18	2.57
Non-HH Labor Payments/Ha	4546	4.57	59.29	0	2317.5	96.61
<i>Land Tenure and Control, 1984-1985</i>						
Own Lineage	4567	0.75	0.43	0	1	
Inherited	4567	0.71	0.46	0	1	
Borrowed	4567	0.28	0.45	0	1	
Tenure Security (1-6)	4498	4.82	1.9	1	6	

**Table A3: Summary Statistics, Goldstein-Udry Ghana 1996-98**

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	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures</i>						
Last Fallow Duration	1229	4.22	2.99	0.17	40	0.00
Years Since Fallow	954	1.54	2.45	0	37.54	0.00
Input Cost per Ha	946	1.35E+05	4.40E+05	0	6.00E+06	47.67
Labor Cost per Ha	947	8.25E+05	2.69E+06	2983.4	7.14E+07	0.00
Seed Cost per Ha	497	2.19E+05	5.35E+05	0	6.00E+06	3.42
Own Labor (Hrs) per Ha	947	555.19	1059.37	0	18200	2.22
Spouse Labor (Hrs) per Ha	947	144.33	581.22	0	11100	44.77
Family Labor (Hrs) per Ha	947	166.17	592.25	0	9200	52.59
Non-Family Labor (Hrs) per Ha	946	188.4	663.44	0	11300	53.70
Total Labor (Hrs) per Ha	946	1029.85	1857.08	3.88	30200	0.00
<i>Land Tenure and Control</i>						
From Spouse	1318	0.11	0.32	0	1	
Plot from Cultivator's Abusua	1298	0.54	0.5	0	1	
From Non-Relative	1318	0.28	0.45	0	1	
Sharecropped or Cash Payment	1235	0.35	0.48	0	1	
Tenure (Years)	1271	8.37	11.72	-0.77	62.26	
Right to Decide Inheritance	1287	0.07	0.26	0	1	
Right to Rent	1289	0.20	0.4	0	1	
Right to Lend	1289	0.25	0.43	0	1	
Right to Mortgage	1288	0.19	0.39	0	1	
Right to Pledge	1284	0.21	0.41	0	1	
Right to Sell	1287	0.12	0.32	0	1	
Right to Register	1285	0.16	0.37	0	1	

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**Table A4: Summary Statistics, Udry Nigeria (Zaria) 1988-89**

	N	Mean	SD	Min	Max	Pct. Zero
<i>Raw Data</i>						
Owned Gona Land Cultivated (Ha)	198	2.63	3.86	0	32.56	18.18
Owned Gona Land Fallow (Ha)	198	0.31	1.75	0	16.71	90.40
Borrowed Gona Land Cultivated (Ha)	198	0.67	1.19	0	7.51	51.01
Borrowed Gona Land Fallow (Ha)	198	0.01	0.07	0	0.64	98.48
Owned Fadama Land Cultivated (Ha)	198	0.36	0.86	0	5.58	55.56
Owned Fadama Land Fallow (Ha)	198	0.04	0.27	0	3.26	94.95
Borrowed Fadama Land Cultivated (Ha)	198	0.12	0.49	0	5.44	79.29
Borrowed Fadama Land Fallow (Ha)	198	0	0.04	0	0.54	98.48
Any Land Owned	198	0.84	0.37	0	1	
Any Land Borrowed	198	0.54	0.5	0	1	
Any Land Fallow	198	0.16	0.36	0	1	
<i>Artificial Plots</i>						
<i>Investment Measures</i>						
Proportion Fallow	399	0.05	0.2	0	1	91.23
<i>Land Tenure and Control</i>						
Owned	399	0.64	0.48	0	1	

**Table A5: Summary Statistics, World Bank Ghana 1987-88**

	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures</i>						
New Drainage	494	0.48	0.5	0	1	74.60
New Manuring	494	0.93	0.26	0	1	49.73
New Excavation	494	0.44	0.5	0	1	76.10
New Irrigation	494	0.51	0.5	0	1	72.66
New Mulching	494	0.35	0.48	0	1	81.16
New Shallot Beds	494	0.75	0.43	0	1	59.63
<i>Land Tenure and Control</i>						
Right to Sell	494	0.78	0.42	0	1	
Right to Rent	494	0.95	0.22	0	1	
Right to Mortgage	494	0.83	0.37	0	1	
Right to Pledge	494	0.89	0.31	0	1	
Right to Bequeath	494	0.67	0.47	0	1	
Right to Gift	494	0.74	0.44	0	1	
Rights With Approval	494	0.65	1.55	0	5	
Rights Without Approval	494	4.21	2.3	0	6	
Inherited	494	0.95	0.23	0	1	
Purchased	494	0.03	0.18	0	1	
Allocated	494	0.00	0.04	0	1	
Ever Litigated	494	0.07	0.26	0	1	
No Title Deed	494	0.89	0.31	0	1	
Years Owned	494	23.53	17.61	1	71	

**Table A6: Summary Statistics, Ghana SN 2001**

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	N	Mean	SD	Min	Max
<i>Investment Measures</i>					
Used HH Labor	8559	0.90	0.30	0	1
Used Exchange Labor	8559	0.67	0.47	0	1
Used Manure	8559	0.03	0.17	0	1
Used HH Waste	8559	0.01	0.07	0	1
Used Chemical Fertilizer	8559	0.24	0.43	0	1
Used Purchased Seed	8559	0.03	0.17	0	1
Prepared with Tractor	8559	0.60	0.49	0	1
Prepared with Bullock	8559	0.11	0.31	0	1
<i>Land Tenure and Control</i>					
Inherited	8559	0.73	0.44	0	1
Leased or Borrowed	8559	0.27	0.44	0	1

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**Table A7: Summary Statistics, Ghana LSS (A) 1988-89**

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	N	Mean	SD	Min	Max
<i>Investment Measures</i>					
Planted Trees	15783	0.05	0.22	0	1
<i>Land Tenure and Control</i>					
Owned	15778	0.37	0.48	0	1
Rented	15778	0.06	0.24	0	1
Sharecropped	15778	0.08	0.27	0	1
Distributed by Village/Family	15778	0.27	0.44	0	1
Used Free of Charge	15778	0.22	0.41	0	1
Owned with Deed	5759	0.22	0.41	0	1
Right to Sell	5759	0.65	0.48	0	1
Right to Use as Security	5759	0.62	0.49	0	1

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**Table A8: Summary Statistics, Ghana (B) LSS 1987-88**

	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures</i>						
Prop. Fallow	3546	0.28	0.27	0	0.99	37.87
Amount Spent on Fertilizer per Acre	3546	61.91	310.57	0	5500	84.09
Amount Spent on Insecticide per Acre	3546	38.23	315.03	0	10000	84.49
Labor Payments: Total per Acre	3546	487.95	1400.48	0	39500	30.77
Rental Payments: Equipment per Acre	3546	75.15	466.32	0	12000	89.54
Prop. Young Cocoa	3546	0.09	0.21	0	1	78.34
Prop. Young Oil Palm	3546	0.08	0.19	0	1	74.56
Prop. Young Plantain	3546	0.15	0.26	0	1	56.63
<i>Land Tenure and Control</i>						
Right to Sell w/o Approval	3546	0.21	0.41	0	1	
Right to Sell w/ Family's Approval	3546	0.08	0.27	0	1	
Right to Sell w/ Chief's Approval	3546	0.01	0.11	0	1	
Right to Rent, Lease or Sharecrop	3546	0.39	0.49	0	1	
Sum of Rights	3546	0.69	0.78	0	2	
Prop. Acquired (Not Govt, Lease or SC)	3546	0.01	0.09	0	1	
Prop. Acquired from Govt	3546	0.01	0.05	0	1	
Prop. Rented or Sharecropped	3546	0.05	0.16	0	1	

**Table A9: Summary Statistics , Mali ZLH 1987-88**

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	N	Mean	SD	Min	Max
<i>Investment Measures</i>					
Not Fully Exploited	2228	0.24	0.43	0	1
<i>Reason for incomplete exploitation:</i>					
Lacked Rain	2228	0.04	0.21	0	1
Lacked Flood	2228	0.10	0.29	0	1
Lacked Labor	2228	0.03	0.18	0	1
Lacked Seeds	2228	0.02	0.13	0	1
Lacked Funds	2228	0.04	0.19	0	1
Other Reason	2228	0.01	0.11	0	1
<i>Land Tenure and Control</i>					
Inherited	2228	0.70	0.46	0	1
Purchased	2228	0.00	0.04	0	1
Sharecropped	2228	0.02	0.15	0	1
Gifted	2228	0.10	0.3	0	1
Borrowed	2228	0.02	0.15	0	1
Rented	2228	0.01	0.08	0	1
Family	2228	0.01	0.12	0	1
Municipal	2228	0.10	0.29	0	1
Other	2228	0.02	0.15	0	1

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**Table A10: Summary Statistics, Ivory Coast LSMS 1985-88**

	N	Mean	SD	Min	Max	Pct. Zero
<i>Investment Measures</i>						
Proportion Fallow	2476	0.31	0.29	0	1	33.44
Seed/Ha	2476	1465.37	6067.23	0	1.50E+05	68.13
Fertilizer/Ha	2476	925.51	3204.99	0	38461.54	82.75
Insecticide/Ha	2476	305.4	1179.29	0	25000	75.16
Paid Labor/Ha	2476	5559.57	17079.32	0	6.00E+05	41.11
Prop. Young Cocoa	2476	0.07	0.15	0	1	71.81
Prop. Young Coffee	2476	0.03	0.1	0	1	86.27
<i>Land Tenure and Control</i>						
Sale Rights	2476	0.45	0.5	0	1	
Transfer Rights	2476	0.59	0.49	0	1	
Sum of Rights	2476	1.05	0.79	0	2	
Bought Land	2476	0.02	0.13	0	1	
Paid to Use Land	2476	0.07	0.25	0	1	
Received Gift of Land	2476	0.07	0.26	0	1	
Gave Gift of Land	2476	0.10	0.31	0	1	
Sharecropper	2476	0.04	0.18	0	1	