AJAE ONLINE APPENDIX:

THE IMPACT OF COMMERCIAL RAINFALL INDEX INSURANCE: EXPERIMENTAL EVIDENCE FROM ETHIOPIA

Shukri Ahmed
Craig McIntosh*
Alexandros Sarris

October 2019

Abstract

We present the results of an experiment introducing commercial rainfall index insurance into drought-prone farming cooperatives in Amhara Region, Ethiopia. We provided a market-priced rainfall deficit insurance product through producer cooperatives, and tested a number of potential ways to kick-start private demand. Take-up of the insurance at market prices is very low, between 0.5% and 3% across seasons. When we use a randomized experiment to distribute small free insurance contracts to farmers, 39% of subsidized individuals enroll but this fails to stimulate input use, yields, or income, nor does it enhance demand in subsequent seasons. A training and promotion on the product improves uptake and willingness to pay, but also does not improve farming outcomes. We conclude with a case study of our efforts to interlink index insurance with credit for agricultural inputs.

Keywords: Ethiopian Agriculture, Index Insurance, Randomized Experiments

JEL Codes: O13, G22, C93

Appendix A. Additional Tables and Figures.

Appendix Table A1. EPIICA survey and activity timeline

Time:	Survey Activities:	Sales Activites:	Payouts:
2011			
Jan – Mar:	Round 1 Survey (baseline)		
2012			
Jan – Mar:	Round 2 Survey (reduced sample in panel)		
July-Aug:		Season 1 sales, standalone only	
2013			
Jan – Mar:	Round 3 Survey (panel)		
Apr:			Season 1 sales payouts.
May-Jul:		Season 2 sales, standalone only	
2014			
Jan – Mar:	Round 4 Survey (panel)		
Apr:			Season 2 sales payouts.
Apr-Jun:		Season 3 sales, takeup only of interlinked in Feres Wega	
2015			
Apr:			Season 3 sales payouts
2016			
Jan – Feb:	Round 5 Survey (Feres Wega village only)		

Appendix Table A2. Correlation between EPIICA payouts and survey-measured agricultural shocks.

		Shock according to survey-based measure of yields		
		No	Yes	Total
Index insurance would have made payout	No	62	9	71
	Yes	17	10	27
	Total	79	19	98

Shock is defined as the kebele/year deviation of the yield index from the kebele mean being in the bottom 20% of the distribution. Both sales years pooled.

Table A3. Baseline Summary Statistics by Regopm.

	Total	North Shewa	West Gojam	South Wollo	North Wollo
Number of Households	1150	388	363	260	139
Share of Households in the Zone (%)	100	100	100	100	100
Average Household Size	5.3	5.5	5.8	4.6	4.99
Number of adult equivalents	4.5	4.7	4.8	3.9	4.23
Average age of the head (years)	49	51.2	46.1	48.9	50.53
Sex of household head (%)					
Male	90.7	90	93.7	89.2	87.77
Female	9.3	10.1	6.3	10.8	12.23
Type of hhld head 's education					
No Education	51.4	43	62	46.3	56.82
Formal Education	21.5	22.2	17.1	26.6	21.97
Informal Education	27.1	34.8	20.9	27	21.21
Duration of hhld head's formal education (years), excluding hh heads with no formal education at all	4.8	5	4.5	5	4.14
Hhld head can read and write in local language					
Read only	8.2	11.6	3.6	11.2	5.04
Read and Write	35.3	34.3	32.8	38.6	38.85
Cannot read or write	56.5	54.1	63.6	50.2	56.12

Source. EPIICA 2011 (R1) Baseline survey

Table A4. Summary statistics on agricultural activities and household incomes and consumption.

	Round 1	**Round 3**	**Round 4**
Farming	(2011)	(2013)	(2014)
Average land owned per hhld (Ha)	1.47	1.24	1.18
Average land cultivated in the past 12 months (Ha)	1.63	1.17	1.1
Average number of parcels per hhld	3.68	3.51	3.49
Percent of area irrigated	0.12	0.14	0.11
Share of Households Using			
Chemical Fertilizer	0.55	0.74	0.72
Organic Fertilizer	0.57	0.53	0.5
Chemicals (pesti/herbicide)	0.26	0.43	0.42
Improved seeds	0.36	0.41	0.37
Household Income and Consumption			
Total income per eq. adult	3,169	4,186	4,526
Total cash income per eq. adult	2,254	3,340	3,682
Total noncash income per eq. adult	915	846	844
Total consumption per equivalent adult	2,591	2,663	2,463
Is current household income adequate to meet needs?			
Not enough even for food	27.2	20.5	12.5
Just enough for food	48.4	40.5	43.4
Just enough for food and necessities	20	27.8	37
Enough to meet most of needs	4.4	11.3	7.1

Source. EPIICA R1, R3, R4 surveys

The years in parentheses refer to the year of realization of the data not the year of the survey

Table A5. Attrition and baseline outcomes

	Household is in a village that was dropped from the study		Household in panel sample of villages but attrites by Round 4	
Outcome:	(1)	(2)	(3)	(4)
Interlinked Village	-0.0753		0.00937	
	(0.119)		(0.0590)	
Standalone Village	-0.121		0.00737	
	(0.118)		(0.0602)	
Treated Village		-0.0970		0.00966
		(0.100)		(0.0568)
Household will receive voucher			-0.0795	-0.0795
			(0.0551)	(0.0563)
Household will receive training				-0.00194
				(0.0189)
Constant (mean attrition in omitted group)	0.701***	0.701***	0.0903***	0.0903***
	(0.0786)	(0.0786)	(0.0238)	(0.0238)
Observations	2,158	2,158	882	882
R-squared	0.010	0.009	0.028	0.028

Regressions run at the household level among all cooperative members, using full baseline samples and clustering standard errors ayt the village level to account for the design effect. Outcome variables are dummies for attrition from village-level study sample (lack of drought exposure or unre-insurable rainfall station), and attrition from the household survey in panel villages, respectively. Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. *** p<0.01, ** p<0.05, * p<0.1

Table A6. Balance test using average pre-treatment outcomes

Panel A: Household Characteristics

	Household Size	Consumption Aggregate	Hired Farm Labor	Age of HH Head	Male-headed household	Marital Status of HH head	Literacy	Education	Household Hired Labor	Productive Asset Index	Consumer Durables
Village-level Treatment	-0.281	-0.186	-0.0606	0.621	-0.103	0.231	-0.175*	-15.54***	-1.477	-290.3	-262.1
	(0.451)	(0.403)	(0.110)	(4.138)	(0.0834)	(0.138)	(0.102)	(3.520)	(1.220)	(428.4)	(316.9)
Household will receive voucher	0.251	0.196	0.130	1.614	0.0797	-0.172	0.239**	18.95***	7.454**	438.4	328.9
	(0.397)	(0.333)	(0.105)	(3.617)	(0.0844)	(0.144)	(0.116)	(5.635)	(3.642)	(332.0)	(288.6)
Household will receive training	0.0689	0.197	0.140	3.383	0.0527	-0.224	0.0863	11.03*	4.140	320.3	424.1
	(0.363)	(0.317)	(0.166)	(4.537)	(0.109)	(0.197)	(0.149)	(6.039)	(3.162)	(683.6)	(444.3)
Voucher * training	0.130	0.0247	-0.160	-3.237	0.00637	0.127	-0.125	-13.17*	0.816	-555.4	-580.6
	(0.454)	(0.379)	(0.175)	(4.502)	(0.105)	(0.193)	(0.169)	(6.959)	(4.127)	(839.9)	(477.2)
Constant	5.381***	4.478***	0.200**	47.07***	0.900***	2.168***	0.408***	-70.02***	2.667**	1,081***	836.7***
	(0.233)	(0.202)	(0.0761)	(1.687)	(0.0201)	(0.0321)	(0.0450)	(2.964)	(1.003)	(363.9)	(251.6)
Observations	834	834	834	834	834	834	834	834	834	834	834
R-squared	0.004	0.006	0.006	0.007	0.013	0.010	0.009	0.008	0.015	0.001	0.002

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. Regressions examine the balance of Round 1 (pre-treatment) covariates and outcomes by the subsequent village-level treatment and individual-level voucher randomization. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A6 (continued)

Panel B: Primary Outcomes.

	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita	Area Cultivated
Village-level Treatment	0.102	-1.373	0.0298	0.00727	-0.128	-7.404	-0.213	-0.132	-0.130
	(0.183)	(46.07)	(0.432)	(0.197)	(0.0958)	(53.61)	(0.142)	(77.63)	(0.216)
Household will receive voucher	0.0985	46.98	0.510	0.0614	0.170*	11.97	0.165	25.64	1.986
	(0.133)	(38.25)	(0.365)	(0.152)	(0.0931)	(38.93)	(0.108)	(84.06)	(1.850)
Household will receive training	0.0592	33.92	0.420	0.212	0.190	70.76	0.154	30.03	0.530**
	(0.119)	(33.25)	(0.314)	(0.154)	(0.151)	(52.09)	(0.127)	(96.36)	(0.205)
Voucher * training	-0.128	-49.36	-0.593	-0.230	-0.312*	-12.06	-0.194	158.1	-1.278
	(0.153)	(42.73)	(0.408)	(0.189)	(0.165)	(66.48)	(0.157)	(226.4)	(0.990)
Constant	0.525***	92.53***	1.094***	0.433***	0.217***	146.2***	0.0736	163.7***	1.241***
	(0.132)	(29.68)	(0.298)	(0.135)	(0.0536)	(30.70)	(0.0748)	(26.84)	(0.142)
Observations	834	825	834	834	824	824	808	832	834
R-squared	0.022	0.017	0.024	0.007	0.021	0.003	0.006	0.002	0.004

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. Regressions examine the balance of Round 1 (pre-treatment) covariates and outcomes by the subsequent village-level treatment and individual-level voucher randomization. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A7. Impact of the Sum Insured.

Panel A: LATE of Sum Insured on Primary Outcomes: Instrumenting for Sum Insured with Voucher Amount

	First stage (Sum Insured)	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sum Insured (instrumented w voucher amt)		4.57e-05	-0.0955	0.000208	0.00121*	-0.000161	-0.144	-0.000431	-0.989**
		(0.000764)	(0.134)	(0.00193)	(0.000690)	(0.000807)	(0.226)	(0.000906)	(0.465)
R3	1.358	0.152*	13.10**	0.357**	0.0929	0.0126	-17.53	-0.0818	101.0**
	(2.402)	(0.0807)	(5.648)	(0.151)	(0.0567)	(0.0293)	(24.47)	(0.131)	(41.23)
R4	-1.404	0.107	14.50***	0.257*	0.0436	-0.100***	-9.942	0.0179	115.2***
	(2.483)	(0.0736)	(4.924)	(0.137)	(0.0621)	(0.0338)	(33.36)	(0.137)	(43.06)
Panel village treatment dummy	-0.951	-0.0178	2.426	-0.0939	-0.167**	0.0951**	-10.15	-0.00951	-127.7**
	(4.018)	(0.0889)	(7.844)	(0.167)	(0.0716)	(0.0384)	(42.57)	(0.145)	(64.80)
Voucher amount (randomized)	2.403***								
	(0.619)								
Constant	0.0213	0.669***	34.32***	0.610***	0.0497	0.162***	88.48***	-0.157*	47.60*
	(2.283)	(0.0500)	(2.879)	(0.0942)	(0.0382)	(0.0186)	(18.70)	(0.0850)	(27.03)
Observations	2,571	2,544	2,428	2,571	2,544	2,541	2,541	2,367	2,561
Number of households	882	881	876	882	881	881	881	871	881
Baseline mean		0.631	114	1.370	0.470	0.185	172.8	0.00962	265.3

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. The first column provides the first stage estimate of voucher amounts on sum insured, and the remaining columns examine the impact of the sum insured, instrumenting for this with the randomized voucher amount. Data includes one pre-treatment rounds and two post-treatment observations. Voucher treatment re-randomized at the individual level in rounds 3 and 4. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A7 Continued.

Panel B: Impact of the Largest Voucher Amounts.

	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Large Voucher (>$20)	-0.00559	-8.606	-0.102	0.0758	-0.0223	-5.166	0.00353	24.89
	(0.0510)	(6.351)	(0.106)	(0.0536)	(0.0472)	(17.74)	(0.0758)	(34.58)
Small Voucher (0<voucher<$20)	0.0565	-1.925	-0.0313	0.0793*	0.0447	-20.53	-0.0363	116.5
	(0.0410)	(6.949)	(0.0989)	(0.0400)	(0.0446)	(27.20)	(0.0388)	(95.19)
Panel village treatment dummy	-0.0436	2.661	-0.0297	-0.185**	0.0659	-6.778	-0.0710	-216.9*
	(0.0922)	(7.802)	(0.172)	(0.0745)	(0.0409)	(28.01)	(0.108)	(110.0)
R3	0.149*	17.11***	0.353**	0.0884	0.0324	6.078	0.00387	98.38**
	(0.0809)	(4.470)	(0.149)	(0.0569)	(0.0236)	(16.87)	(0.0902)	(45.32)
R4	0.112	17.00***	0.234*	0.0361	-0.0825***	15.73	0.113	134.3***
	(0.0743)	(5.240)	(0.135)	(0.0624)	(0.0270)	(24.91)	(0.0984)	(46.80)
Constant	0.640***	112.7***	1.383***	0.475***	0.177***	150.6***	-0.0304*	266.0***
	(0.0271)	(1.435)	(0.0476)	(0.0196)	(0.00739)	(6.210)	(0.0161)	(28.10)
Observations	2,544	3,280	2,571	2,544	3,416	3,416	3,191	2,561
R-squared	0.045	0.022	0.038	0.023	0.024	0.001	0.010	0.005
Number of households	881	880	882	881	882	882	875	881
F-test that Large = Small	2.916	1.627	0.547	0.00608	4.862	0.287	0.431	1.616
p-value on F-test that Large = Small	0.0942	0.208	0.463	0.938	0.0323	0.595	0.515	0.210

Regressions are household fixed-effects analysis among all cooperative members. Data includes two pre-treatment rounds for some variables and one for others; all variables have two post-treatment observations. Voucher treatment re-randomized at the individual level in rounds 3 and 4. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A8. Heterogeneous Impacts of Vouchers by Baseline Credit Rationing Status

Interacted Specification.	Covered by Insurance	Sum Insured	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Any Voucher	0.340***	38.97***	-0.00520	-18.77	-0.0222	-0.00805	0.0185	-13.72	-0.0483	-16.61
	(0.0491)	(7.994)	(0.0389)	(16.40)	(0.117)	(0.0555)	(0.0481)	(20.48)	(0.0569)	(37.22)
Any Voucher * Risk Constrained	0.0822	-5.557	-0.0205	-2.202	-0.0470	0.00464	0.0412	0.0600	0.103	-44.04
	(0.0710)	(9.107)	(0.0579)	(12.75)	(0.153)	(0.0654)	(0.0559)	(22.15)	(0.0831)	(56.30)
Any Voucher * Price Constrained	-0.0233	-14.89	0.0398	-18.18	0.0561	0.0338	-0.0559	-3.280	-0.0855	68.95
	(0.0758)	(9.623)	(0.126)	(20.67)	(0.306)	(0.116)	(0.0864)	(26.82)	(0.0854)	(56.43)
Any Voucher * Quantity Constrained	0.0309	-7.015	-0.0396	-17.23	-0.263*	-0.0462	-0.0381	-35.85	-0.00428	45.14
	(0.0442)	(7.919)	(0.0445)	(16.40)	(0.144)	(0.0649)	(0.0533)	(25.35)	(0.0610)	(37.13)
Risk Constrained	6.59e-06	-0.0517	-0.0924*	-42.24***	-0.406**	-0.0997	-0.0197	-53.01**	-0.0862	-124.5
	(0.000237)	(0.0959)	(0.0505)	(13.84)	(0.160)	(0.0683)	(0.0268)	(19.86)	(0.0574)	(102.4)
Price Constrained	1.32e-05	-0.103	-0.155*	-46.74*	-0.578**	-0.220***	-0.0101	-73.09***	-0.0575	-111.1
	(0.000469)	(0.185)	(0.0839)	(26.19)	(0.230)	(0.0770)	(0.0424)	(24.63)	(0.0809)	(87.85)
Quantity Constrained	-4.34e-06	0.0341	-0.0357	-14.12	-0.286*	-0.0189	0.000720	-24.80	-0.0776	-231.8**
	(0.000156)	(0.0928)	(0.0493)	(16.46)	(0.153)	(0.0593)	(0.0248)	(25.86)	(0.0470)	(114.1)
Treated Village	-0.000495	3.883	0.0646	-0.0968	0.0926	0.0654	0.0479	-20.91	0.0296	3.242
	(0.0177)	(2.870)	(0.0880)	(25.33)	(0.243)	(0.0710)	(0.0385)	(28.05)	(0.103)	(112.6)
Round 3	0.000506	-3.971	0.0175	1.441	-0.0143	0.00288	-0.0608*	-14.23	0.131	31.01
	(0.0181)	(2.934)	(0.0919)	(28.85)	(0.252)	(0.0827)	(0.0360)	(35.36)	(0.113)	(102.5)
Round 4	-0.000193	1.510	0.126	45.97	0.351	-0.0711	0.0451	41.29	-0.0815	-20.84
	(0.00690)	(1.244)	(0.108)	(36.49)	(0.306)	(0.112)	(0.0506)	(37.04)	(0.119)	(102.8)
Constant	-8.88e-07	0.00696	0.664***	122.5***	1.535***	0.504***	0.180***	167.6***	0.00163	343.9**
	(3.22e-05)	(0.0354)	(0.0624)	(18.54)	(0.202)	(0.0708)	(0.0229)	(22.05)	(0.0514)	(139.0)
Observations	3,446	3,446	2,544	3,280	2,571	2,544	3,416	3,416	3,191	2,561
R-Squared	0.296	0.177	0.038	0.033	0.044	0.019	0.015	0.007	0.013	0.004
Baseline Control Mean	0	0	0.631	114	1.370	0.470	0.185	172.8	0.00962	265.3

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. Data includes two pre-treatment rounds for some variables and one for others; all variables have two post-treatment observations. Voucher treatment re-randomized at the individual level in rounds 3 and 4. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A9. Heterogeneity in Impacts for Non-Cooperative Members.

	Bought Insurance	Sum Insured	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Any Voucher * Non Coop Member	0.00929	-0.0903	0.000307	-1.637	0.0627	0.0146	-0.0541	8.247	0.00390	53.07
	(0.0792)	(9.503)	(0.0746)	(12.46)	(0.193)	(0.0804)	(0.0500)	(12.94)	(0.0914)	(100.5)
Any Voucher	0.362***	38.05***	-0.0643	-8.117	-0.218*	-0.0440	-0.0137	-20.24	-0.0575	17.10
	(0.0482)	(6.548)	(0.0521)	(10.78)	(0.115)	(0.0545)	(0.0653)	(13.10)	(0.0648)	(45.39)
Not Coop Member	7.48e-05	0.00914	-0.137**	-58.30***	-0.458***	-0.175***	-0.00224	-66.57***	-0.0376	-2.593
	(0.000324)	(0.0433)	(0.0521)	(12.51)	(0.119)	(0.0495)	(0.0338)	(15.40)	(0.0526)	(87.24)
Treated Village	-0.00136	-0.166	0.0736	11.97	0.393	-0.0909	0.0721	29.94	-0.0353	-172.2
	(0.00548)	(0.745)	(0.113)	(27.98)	(0.278)	(0.105)	(0.0907)	(25.00)	(0.113)	(104.9)
R3	-0.00545	-0.666	0.238**	20.79	0.293	0.130*	0.0405	-6.654	0.0214	186.3**
	(0.0220)	(3.010)	(0.0943)	(19.49)	(0.206)	(0.0752)	(0.0460)	(20.87)	(0.107)	(85.49)
R4	0.00522	0.639	0.180*	19.38	0.170	0.133*	-0.0290	-5.854	0.0740	188.8**
	(0.0211)	(2.887)	(0.0985)	(19.21)	(0.225)	(0.0773)	(0.0544)	(24.03)	(0.101)	(93.52)
Constant	-4.44e-05	-0.00543	0.564***	108.8***	1.272***	0.426***	0.167***	147.3***	-0.0286	218.0***
	(0.000193)	(0.0258)	(0.0632)	(16.81)	(0.171)	(0.0627)	(0.0199)	(17.01)	(0.0401)	(78.99)
Observations	3,822	3,822	2,822	3,621	2,853	2,822	3,788	3,788	3,524	2,841
R-squared	0.304	0.183	0.076	0.077	0.064	0.040	0.009	0.021	0.004	0.005
Baseline Control mean	0	0	0.631	114	1.370	0.470	0.185	172.8	0.00962	265.3

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. The first two columns estimate the effect of the intervention on uptake (acceptance of the free insurance voucher). Remaining columns examine impacts on agricultural and household outcomes. Data includes two pre-treatment rounds for some variables and one for others; all variables have two post-treatment observations. Voucher treatment re-randomized at the individual level in rounds 3 and 4. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A10. Heterogeneity in Impacts by PSNP Eligibility Status.

Panel A. The Impact of PSNP Eligibility on Insurance Demand.

	Outcome: Was Insured	
	(1)	(2)
VARIABLES	Took up Insurance Voucher	
PSNP at baseline	0.0472	
	(0.0671)	
PSNP in village at baseline		0.0661
		(0.0872)
Voucher amount	0.00470	0.00473
	(0.00326)	(0.00325)
Constant	0.280***	0.267***
	(0.0615)	(0.0683)
Observations	871	871
R-squared	0.006	0.008

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

Table A10 Continued. Heterogeneity in Impacts by PSNP Eligibility Status.

Panel B. Differential Impacts of Insurance by PSNP Status.

	Bought Insurance	Sum Insured	Any Chemical Fertilizer	KGs of Chemical Fertilizer	Number of crops using Chemical Fertilizer	Uses any Improved Seeds	Uses any Input Credit	Total Value of Inputs Used	Index of Agricultural Yields	HH Income per Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Any Voucher	0.395***	38.50***	-0.0161	-18.25	-0.0628	-0.0102	0.00680	-13.40	-0.0318	-20.68
	(0.0409)	(5.977)	(0.0378)	(11.73)	(0.107)	(0.0451)	(0.0328)	(13.31)	(0.0506)	(25.01)
Any Voucher * PSNP at baseline	-0.0204	-8.444	0.244**	-8.069	0.333	-0.0346	-0.0869**	-12.54	-0.0211	-22.28
	(0.0621)	(8.120)	(0.111)	(14.93)	(0.254)	(0.0877)	(0.0344)	(16.41)	(0.0791)	(48.99)
PSNP at baseline	-0.000361	0.00179	-0.365***	-97.50***	-1.001***	-0.241***	-0.116***	-102.6***	-0.171***	-37.93
	(0.000430)	(0.0446)	(0.0735)	(15.56)	(0.205)	(0.0793)	(0.0268)	(15.15)	(0.0454)	(62.05)
R3	-0.0232	0.115	0.177***	5.174	0.337	0.0506	0.0584	-10.51	-0.0379	19.66
	(0.0186)	(2.855)	(0.0648)	(19.00)	(0.211)	(0.0568)	(0.0374)	(19.94)	(0.0790)	(80.10)
R4	0.0240	-0.119	0.124*	6.902	0.203	0.0300	-0.0178	-5.555	0.0914	40.84
	(0.0193)	(2.954)	(0.0640)	(20.88)	(0.213)	(0.0615)	(0.0352)	(22.84)	(0.0816)	(74.31)
t_panel	-0.00934	0.0463	0.0525	34.80	0.185	-0.0313	0.0293	31.17	-0.0550	-15.02
	(0.00773)	(1.149)	(0.0686)	(28.88)	(0.270)	(0.0914)	(0.0493)	(26.89)	(0.0951)	(79.70)
Constant	4.78e-05	-0.000237	0.595***	101.5***	1.314***	0.400***	0.167***	140.5***	-0.0169	252.7***
	(5.62e-05)	(0.00591)	(0.0545)	(14.79)	(0.173)	(0.0543)	(0.0195)	(16.09)	(0.0346)	(72.20)
Observations	3,446	3,446	2,544	3,280	2,571	2,544	3,416	3,416	3,191	2,561
R-squared	0.318	0.189	0.099	0.083	0.076	0.030	0.024	0.016	0.019	0.000
Baseline mean	0	0	0.546	91.11	1.180	0.368	0.153	147.6	0.00389	247.6

Regressions present pooled OLS analysis, weighted to be representative of cooperative members in study villages. The first two columns estimate the effect of the intervention on uptake (acceptance of the free insurance voucher). Remaining columns examine impacts on agricultural and household outcomes. Data includes two pre-treatment rounds for some variables and one for others; all variables have two post-treatment observations. Voucher treatment re-randomized at the individual level in rounds 3 and 4. Robust standard errors are reported in parentheses, clustered at the village level to account for the design effect. *** p<0.01, ** p<0.05, * p<0.1

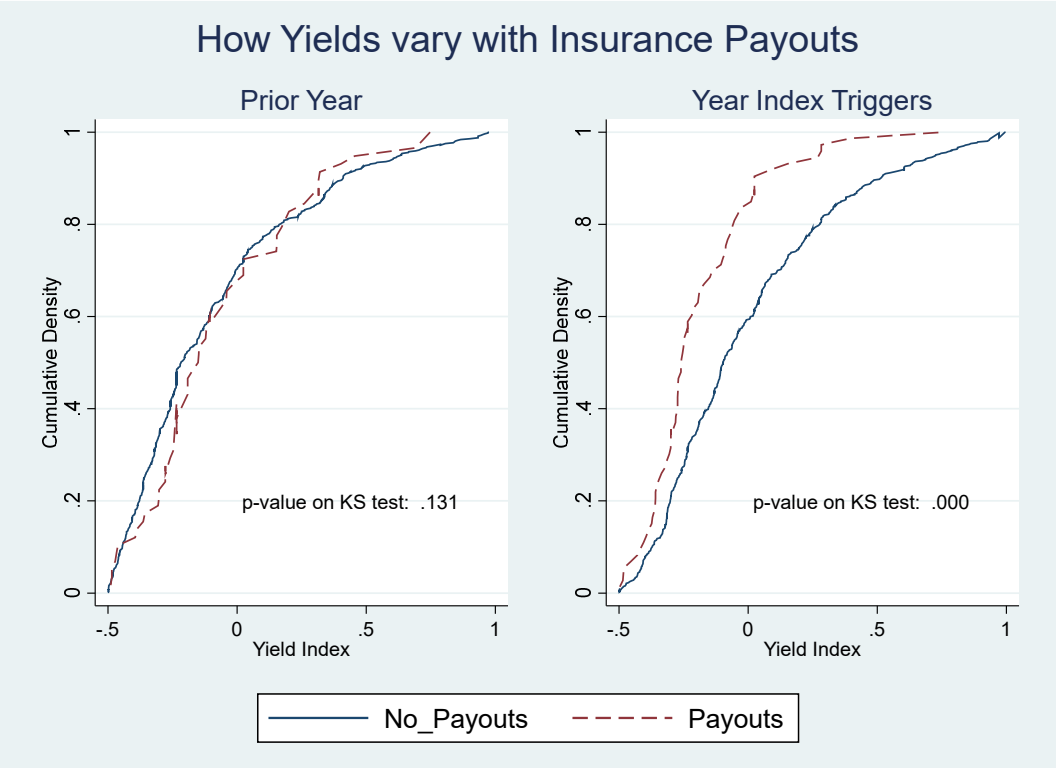
Table A11. Descriptive Statistics from Feres Wega where the Interlinked Loans were Marketed.

Reported Changes in Input Use:

Input:	Number Increasing	% Increasing	Number Decreasing	% Decreasing	Number with No Change
Local Seeds	20	18.5%	3	2.8%	85
Improved Seeds	28	25.9%	5	4.6%	75
Organic Fertilizer	28	25.9%	5	4.6%	75
UREA	72	66.7%	9	8.3%	27
DAP	70	64.8%	9	8.3%	29
Insecticides/Herbicides	17	15.7%	2	1.9%	89
Veterinary Services	7	6.5%	0	0.0%	101
Other Livestock Inputs	4	3.7%	1	0.9%	103

Data come from the Round 5 survey conducted only in the village of Feres Wega where interlinked insurance was successfully sold.

Appendix Figure A1. CDFs of Survey-Measured Yields, by Insurance Payout Status.



Appendix Figure A2A. Map of Rainfall Stations and the Study Area.

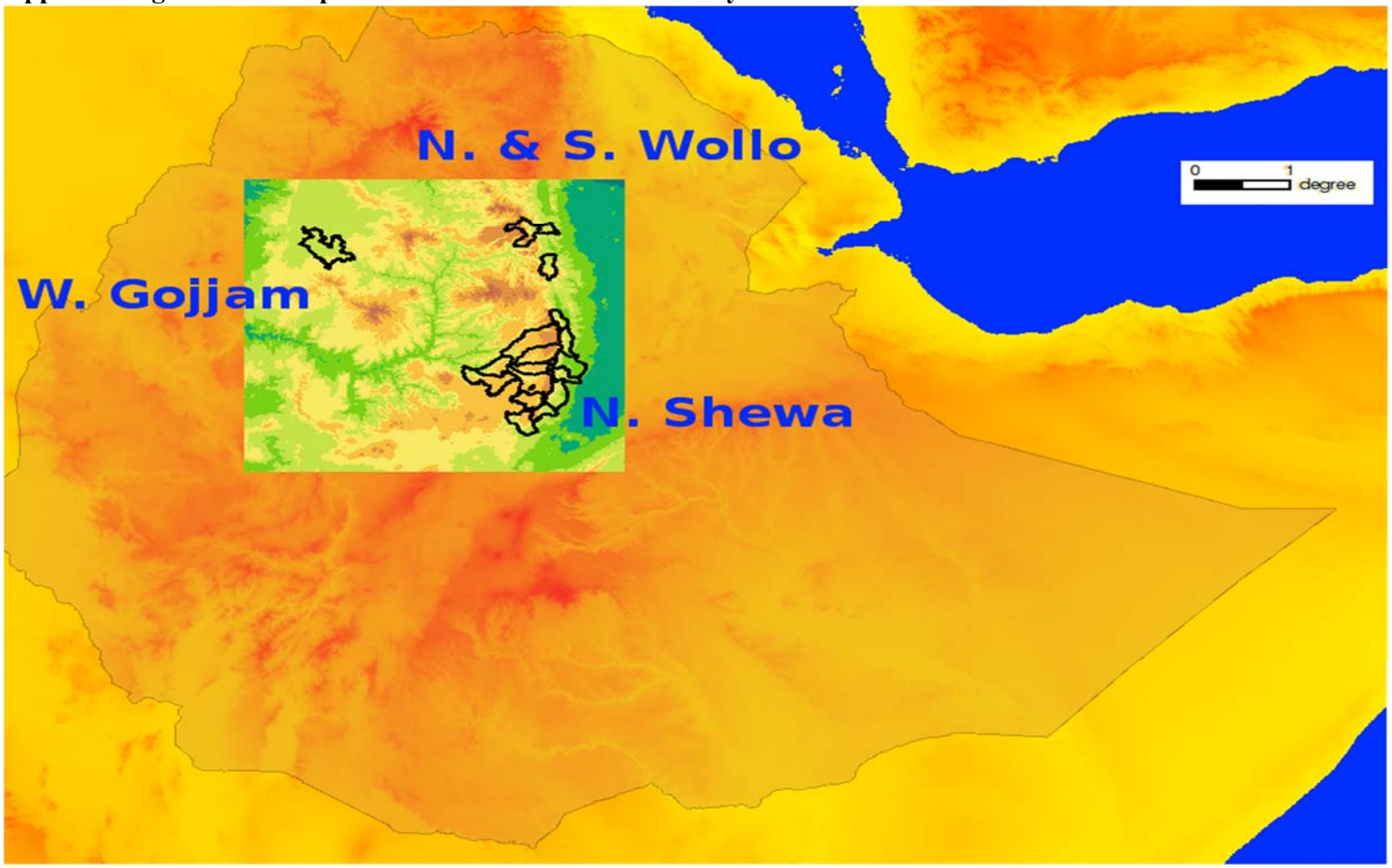
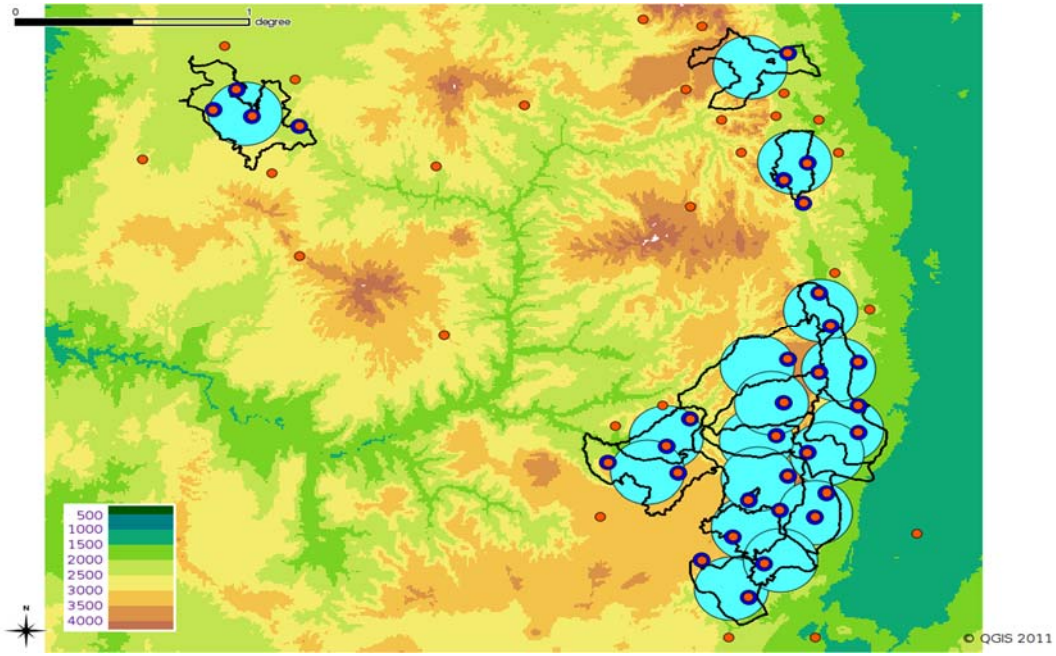


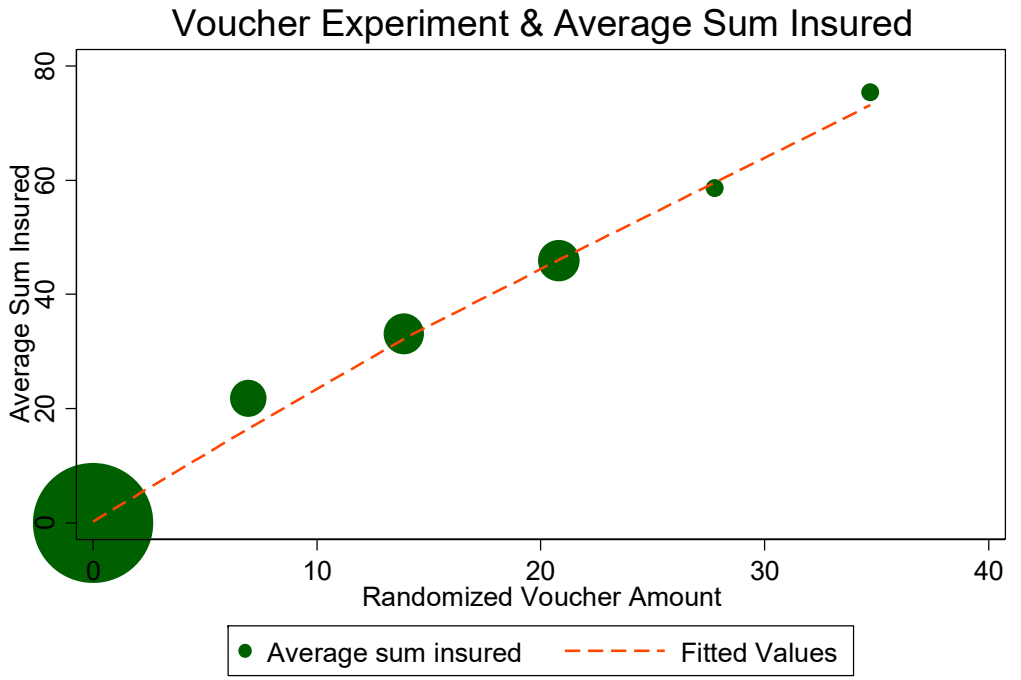
Figure A2B. Map of study woredas (drawn in lines) and rainfall stations (along with their 20 km perimeter).



Source. Ethiopian statistical agency and NMA.

Note. The red dots represent study village locations, and the the light blue circles are centered around the rainfall stations. The black lines represent geographical boundaries of woredas (larger administrative regions each including several villages or kebeles)

Figure A3. Average Sum Insured by Randomized Voucher Amount.



All values in 2010 US$. Size of dots proportional to number of observations at each assigned value.