Long-range forecasts as climate adaptation: Experimental evidence from developing-country agriculture

Online appendix

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A Appendix tables and figures

Table A.1: Differential attrition by treatment group

	(1)
Forecast	-0.010
	(0.016)
Insurance	-0.038***
	(0.014)
Control mean	0.04
Observations	1240

Notes: This table presents attrition (defined as being present in the first baseline round but not present in *either* baseline round II or endline) by treatment status. The regression includes strata fixed effects. Errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.2: Correlates of attrition (control only)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2022 onset prior	0.023							
	(0.024)							
2022 onset SD		0.154^{**}						
		(0.071)						
# of households			-0.000					
			(0.000)					
# of farmers				-0.000				
				(0.000)				
% area rain-fed					0.000			
					(0.000)			
% area irrigated						-0.000		
						(0.001)		
Cultivated area (ha)							-0.000	
							(0.000)	
District = Medak								-0.056^{**}
								(0.024)
Ctrl. mean indep. var.	4.91	1.00	411.89	449.61	55.61	30.69	364.30	0.41
Observations	495	495	495	495	495	495	495	495

Notes: This table presents correlates of attrition (defined as being present in the first baseline round but not present in *either* baseline round II or endline). We restrict the sample to control group households only. 2022 onset prior (SD) is the mean (SD) of a household's prior belief distribution (elicited using the beans task described in Section 4 and measured in kartes), and are measured at the individual level. All other covariates are measured at the village level. Errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.3: Balance across treatment arms

	(1)	(2)	(3)	Difference		
	Control	**Forecast**	**Insurance**	(2)-(1)	(3)-(1)	(2)-(3)
	Panel A: Village characteristics					
# of households	413.82	470.45	378.68	56.63	−35.14	91.77
	[367.61]	[647.08]	[249.78]	(74.51)	(51.08)	(73.76)
# of farmers	453.16	480.57	549.70	27.41	96.54	−69.13
	[526.19]	[461.82]	[615.04]	(70.21)	(101.59)	(98.26)
Cultivated area (ha)	365.67	362.94	420.78	−2.73	55.10	−57.84
	[375.22]	[356.27]	[451.81]	(51.88)	(74.04)	(73.00)
% area rain-fed	55.63	56.47	59.65	0.84	4.02	−3.19
	[23.15]	[23.67]	[21.39]	(3.32)	(3.81)	(3.84)
% area irrigated	30.77	29.73	32.17	−1.05	1.39	−2.44
	[19.84]	[20.16]	[19.37]	(2.84)	(3.38)	(3.40)
Observations	100	100	50			
	Panel B: Household-level characteristics					
HH size	5.39	5.30	5.25	−0.08	−0.14	0.06
	[2.52]	[2.35]	[2.07]	(0.18)	(0.20)	(0.20)
HH head age	47.99	47.48	46.43	−0.51	−1.57	1.06
	[12.31]	[11.67]	[11.78]	(0.93)	(1.24)	(1.20)
HH head educ	6.05	6.03	6.45	−0.03	0.39	−0.42
	[5.12]	[5.05]	[5.04]	(0.38)	(0.50)	(0.51)
# of plots	2.01	1.98	2.07	−0.03	0.06	−0.10
	[1.20]	[1.09]	[1.12]	(0.10)	(0.12)	(0.11)
Total land (ha)	2.71	2.32	2.54	−0.38	−0.16	−0.22
	[4.75]	[2.38]	[2.24]	(0.28)	(0.31)	(0.26)
Observations	472	481	247			
	Panel C: Beliefs about the monsoon					
2022 onset mean	4.89	4.84	4.86	−0.05	−0.03	−0.02
	[0.65]	[0.50]	[0.52]	(0.07)	(0.09)	(0.08)
2022 onset SD	0.98	0.89	0.90	−0.09**	−0.08*	−0.01
	[0.32]	[0.27]	[0.29]	(0.04)	(0.04)	(0.04)
Historical onset mean	4.84	4.83	4.96	−0.01	0.12	−0.13*
	[0.57]	[0.50]	[0.46]	(0.07)	(0.08)	(0.08)
Historical onset SD	0.82	0.77	0.79	−0.05**	−0.03	−0.01
	[0.19]	[0.19]	[0.19]	(0.02)	(0.03)	(0.03)
Observations	472	481	247			

Notes: This table presents balance across the three treatment arms. Panel A presents balance at the village level. Panels B and C present balance at the household level. All outcomes in Panel C are measured in kartes using the beans task described in Section 4. errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.4: Effect of forecast and insurance offers on takeup

	(1) Forecast takeup	(2) Insurance takeup	(3) Forecast Bin 1	(4) Forecast Bin 2	(5) Forecast Bin 3	(6) Insurance takeup
Forecast	0.866***	0.001				
	(0.026)	(0.003)				
Insurance	0.001	0.859***	0.020	0.003	0.001	0.865***
	(0.005)	(0.036)	(0.012)	(0.005)	(0.001)	(0.032)
Forecast × Ind Bin 1			0.819***	0.000	0.001	0.023
			(0.043)	(0.006)	(0.002)	(0.017)
Forecast × Ind Bin 2			-0.001	0.892***	0.000	0.001
			(0.009)	(0.027)	(0.001)	(0.012)
Forecast × Ind Bin 3			0.009	0.001	0.925***	-0.023*
			(0.014)	(0.005)	(0.025)	(0.013)
Control Mean	0.00	0.00	0.00	0.00	0.00	0.00
Observations	1201	1201	1201	1201	1201	1201

Notes: This table presents the treatment effect of offering the forecast and insurance treatments on takeup of those treatments. We estimate Columns (1) and (2) using Equation (2) with forecast take-up and insurance takeup as the outcome variable, respectively. Columns (3) through (6) present results estimated using Equation (3), with the interaction between forecast takeup and prior bins 1–3 (Columns 3–5), and insurance takeup (Column 6) as the outcome variable. All columns include strata fixed effects and control variables selected by double-selection LASSO. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.5: Relationship between forecast and insurance takeup and prior beliefs

	(1) Forecast takeup	(2) Forecast takeup	(3) Insurance takeup	(4) Insurance takeup
Mean of Prior Distribution	0.120**		0.097*	
	(0.059)		(0.054)	
Individual Prior Terciles=2		0.090		0.057
		(0.060)		(0.068)
Individual Prior Terciles=3		0.124*		0.128*
		(0.063)		(0.069)
Test Tercile 2=3		0.366		0.158
Mean	0.86	0.80	0.86	0.80
Observations	481	481	247	247

Notes: This table presents the relationship between prior beliefs and takeup of the forecast or insurance offer. Mean of Prior Distribution is the mean of the farmer's beans task. Individual Prior Terciles = 2 and = 3 are indicators for the second tercile (average prior) and the third tercile (late prior) of farmer beliefs, respectively. In Columns (2) and (4), the first tercile (early prior) is the omitted category. Columns (1) and (2) consider takeup of the forecast, and restrict the sample to households who were in forecast villages only. Columns (3) and (4) consider takeup of insurance, and restrict the sample to households who were in insurance villages only. In Columns (1) and (3), the mean is the mean of the overall group; in Columns (2) and (4), the mean is for Prior Tercile 1. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.6: Effect of the forecast on beliefs by prior strength

	(1) | posterior − forecast |	(2) | posterior − prior |	(3) K-S Stat
Forecast	-0.137	-0.182*	-0.044
	(0.087)	(0.097)	(0.028)
Stdv of Prior × Forecast	-0.140	-0.238	-0.039
	(0.204)	(0.245)	(0.080)
Stdv of Prior Distribution	0.254**	0.374**	0.062
	(0.128)	(0.172)	(0.053)
Control Mean	0.70	0.89	0.44
Observations	921	921	921

Notes: This table presents estimates of the treatment effect of forecasts on farmers' beliefs about the onset timing of the Indian Summer Monsoon, estimated using Equation (2). To compute priors and posteriors, we use the beans task described in Section 4. |posterior - forecast| is the absolute difference between a respondent's posterior and the forecast date for the monsoon onset. |posterior - prior| is the absolute difference between a respondent's prior and posterior belief for when the monsoon will arrive. K-S Stat is the Kolmogorov–Smirnov test statistic for the difference between a respondent's prior distribution and their posterior distribution. Stdv of Prior is the standard deviation of the respondent's prior belief distribution, where higher values reflect more uncertainty. We exclude households where we were unable to speak to the same respondent when eliciting priors and posteriors. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.7: Correlation between beliefs and farmer characteristics

	Mean of prior belief distribution (kartes)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HH size	0.009							
	(0.009)							
HH head age		0.001						
		(0.002)						
HH head education			0.003					
			(0.004)					
HH head home village (1/0)				0.228**				
				(0.091)				
# of plots					-0.018			
					(0.019)			
Total land (ha)						-0.011**		
						(0.005)		
Cash crops 2021 (1/0)							-0.040	
							(0.056)	
Risk aversion								-0.002
								(0.007)
Ctrl. mean indep. var.	5.39	47.99	6.05	0.92	2.01	2.71	0.52	4.64
Observations	1202	1202	1202	267	1202	1202	1202	1202

Notes: Notes: This table presents the correlation between farmers' prior beliefs (measured in kartes, using the beans task described in Section 4) and baseline characteristics. HH size is the number of household members (including the head), HH head age is the age of the household head in years, HH head education is the household head's years of schooling. HH head home village is an indicator for whether the household head was born in their current village. # of plots is the number of plots farmed by the household. Total land (ha) is acres of land farmed by the household. Cash crops 2021 (1/0) is an indicator for having farmed cash crops in Kharif 2021. Risk aversion measures the farmer's choice in an incentivized risk game where higher values indicate that the farmer is more risk averse. Ctrl. mean indep. var. is the mean of the independent variable in the control group. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.8: Effect of forecast on untreated farmer beliefs (spillover sample)

	(1) Arrival Date	(2) Arrive Ontime
Forecast Village	0.066 (2.139)	-0.007 (0.007)
Control Mean	1.27	0.00
Observations	303	304

Notes: Notes: This table presents the effect of information spillovers on beliefs. Forecast Village is an indicator for being an untreated village (ie, not in the main sample) in a forecast offer village. Arrival Date is the date that the farmer expected the monsoon to arrive in kartes. Arrive On time is an indicator for whether the farmer believed the monsoon would arrive on time, using their own criteria. The sample includes only farmers in the control group and *untreated* farmers in the forecast. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.9: Correlation between yield and changing a crop

	Yield (Kg/ha)					
	(1)	(2)	(3)	(4)	(5)	(6)
Different Crop	-3.936** (1.900)	-2.882 (1.806)				
Added Crop			-5.025** (2.292)	-2.233 (1.767)		
Subtracted Crop					1.704 (2.290)	-1.628 (1.793)
Controls	No	Yes	No	Yes	No	Yes
Control Mean	35.61	35.61	34.17	34.17	31.92	31.92
Observations	1178	1178	1178	1178	1178	1178

Notes: This table shows the correlation between yield, measured in kilograms per hectare, and whether the farmer grew a different crop in Kharif 2022 vs. Kharif 2021, added a new crop from 2021 to 2022, or subtracted a crop from 2021 to 2022. Where indicated, we control for specific crop choice and total land cultivated at endline. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.10: Effect of the forecast and insurance on particular crops

	Panel A: Forecast vs. Insurance			
	(1) Cotton	(2) Paddy	(3) Maize	(4) Cash Crop Count
Forecast	0.03	-0.07***	0.01	0.08*
	(0.03)	(0.03)	(0.02)	(0.04)
Insurance	0.05	0.00	0.02	0.17**
	(0.04)	(0.03)	(0.03)	(0.07)

	Panel B: Forecast Terciles			
Forecast × Ind Bin 1	0.01	-0.06	-0.01	-0.04
	(0.05)	(0.04)	(0.03)	(0.07)
Forecast × Ind Bin 2	0.02	-0.11***	-0.02	0.12*
	(0.04)	(0.04)	(0.03)	(0.07)
Forecast × Ind Bin 3	0.08	0.03	0.05	0.25***
	(0.06)	(0.05)	(0.05)	(0.08)
Tercile 1=3	0.348	0.141	0.340	0.006
Insur. = Ter. 3	0.774	0.724	0.611	0.392
Control Mean	0.41	0.72	0.11	0.62
Observations	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on inputs, estimated using Equations (2, panel A) and (3, panel B). Cotton, Paddy, and Maize are indicators for whether the farmer grew each crop in Kharif 2022. Cash crop count is the total number of cash crops grown by the farmer in Kharif 2022. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.11: Effect of the forecast and insurance on household finances

	Panel A: Forecast vs. Insurance				
	(1) Savings	(2) Took Loan	(3) Debt Out	(4) Missed Payment	(5) Farm Loan
Forecast	-12.48	-0.04	-200.07	-0.10	-0.07*
	(24.80)	(0.04)	(180.01)	(0.06)	(0.04)
Insurance	-52.05**	0.19***	345.55	0.02	0.19***
	(24.82)	(0.05)	(280.38)	(0.06)	(0.05)
q-val Forecast	0.585	0.485	0.485	0.485	0.485
q-val Insurance	0.038	0.001	0.123	0.375	0.001

	Panel B: Forecast Terciles				
Forecast × Ind Bin 1	-46.39	-0.06	-624.71**	-0.12	-0.09
	(40.02)	(0.06)	(286.00)	(0.09)	(0.06)
Forecast × Ind Bin 2	11.12	-0.05	39.07	-0.11	-0.10*
	(32.56)	(0.06)	(227.55)	(0.09)	(0.05)
Forecast × Ind Bin 3	3.94	0.01	-70.11	0.02	-0.02
	(41.23)	(0.08)	(321.63)	(0.13)	(0.08)
q-val Tercile 1	0.328	0.385	0.171	0.301	0.301
q-val Tercile 2	1.000	0.777	1.000	0.718	0.416
q-val Tercile 3	1.000	1.000	1.000	1.000	1.000
Test Tercile 1=3	0.349	0.509	0.195	0.339	0.430
Test Insur. = Ter. 3	0.230	0.024	0.214	0.937	0.017
Control Mean	149.23	0.50	1173.75	0.43	0.47
Observations	1129	1201	1201	269	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on household finances, estimated using Equations (2, panel A) and (3, panel B). Savings is total savings in USD, Took Loan is an indicator for whether the household took a loan in the last 12 months, Debt Out is the amount of outstanding debt in USD, Missed Payment is an indicator for having missed a loan payment in the last 12 months, and Farm Loan is an indicator for having taken a farm loan in the last 12 months. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.12: Effect of the forecast and insurance on other income-generating activities

	Panel A: Forecast vs. Insurance	
	(1) Labor Inc.	(2) Livestock Inc.
Forecast	-10.02*	-13.66
	(5.82)	(13.00)
Insurance	-0.96	-12.76
	(6.73)	(13.11)
q-val Forecast	0.206	0.206
q-val Insurance	1.000	1.000

	Panel B: Forecast Terciles	
Forecast × Ind Bin 1	-18.03**	-21.81
	(8.34)	(23.80)
Forecast × Ind Bin 2	-1.18	-34.89**
	(6.61)	(15.50)
Forecast × Ind Bin 3	-4.45	10.47
	(11.33)	(22.63)
q-val Tercile 1	0.066	0.220
q-val Tercile 2	0.752	0.052
q-val Tercile 3	1.000	1.000
Test Tercile 1=3	0.317	0.318
Insur. = Ter. 3	0.886	0.252
Control Mean	46.36	55.89
Observations	1199	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on other income-generating activities, estimated using Equations (2, panel A) and (3, panel B). Labor Inc. is labor income and Livestock Inc. is income from selling livestock in the last 12 months, both in USD. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.13: Effect of the forecast and insurance on assets

	Panel A: Forecast vs. Insurance		
	(1) Asset Count	(2) Asset Value	(3) Livestock Count
Forecast	-0.20	45.61	0.05
	(0.54)	(156.57)	(0.04)
Insurance	0.94	-78.28	0.00
	(1.23)	(167.81)	(0.04)
q-val Forecast	1.000	1.000	1.000
q-val Insurance	1.000	1.000	1.000

	Panel B: Forecast Terciles		
Forecast × Ind Bin 1	0.50	402.62	0.06
	(0.94)	(307.25)	(0.05)
Forecast × Ind Bin 2	0.27	19.15	0.03
	(0.76)	(171.56)	(0.05)
Forecast × Ind Bin 3	-2.06**	-154.54	0.05
	(0.99)	(162.12)	(0.08)
q-val Tercile 1	0.469	0.469	0.469
q-val Tercile 2	1.000	1.000	1.000
q-val Tercile 3	0.129	0.517	0.541
Test Tercile 1=3	0.054	0.103	0.899
Test Insur. = Ter. 3	0.034	0.402	0.642
Control Mean	7.38	1503.10	0.45
Observations	1201	1201	572

Notes: This table presents estimates of the treatment effects of forecasts and insurance on assets, estimated using Equations (2, panel A) and (3, panel B). Non-Asset Count is the number of assets reported by the household. Asset value is the value of these assets in USD. Livestock count is the number of livestock reported by the household. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.14: Effect of the forecast and insurance on migration

	Panel A: Forecast vs. Insurance				
	(1) Any Migrant	(2) Num Temp Mig.	(3) N. Female	(4) N. Male	(5) Remittances
Forecast	-0.03	-0.10**	-0.04*	-0.06*	-1.24
	(0.02)	(0.04)	(0.02)	(0.03)	(2.71)
Insurance	-0.02	-0.12**	-0.05***	-0.06*	-3.87
	(0.03)	(0.05)	(0.02)	(0.03)	(2.54)
q-val Forecast	0.095	0.095	0.095	0.095	0.243
q-val Insurance	0.191	0.038	0.038	0.065	0.107

	Panel B: Forecast Terciles				
Forecast × Ind Bin 1	-0.03	-0.15**	-0.07**	-0.07	0.74
	(0.04)	(0.07)	(0.03)	(0.04)	(4.54)
Forecast × Ind Bin 2	-0.02	-0.03	-0.01	-0.02	-1.76
	(0.03)	(0.05)	(0.02)	(0.04)	(2.12)
Forecast × Ind Bin 3	0.00	-0.10	-0.04	-0.05	-5.48*
	(0.05)	(0.08)	(0.03)	(0.06)	(3.18)
q-val Tercile 1	0.319	0.066	0.062	0.126	0.535
q-val Tercile 2	1.000	1.000	1.000	1.000	1.000
q-val Tercile 3	0.694	0.694	0.694	0.694	0.694
Test Tercile 1=3	0.629	0.643	0.375	0.817	0.259
Insur. = Ter. 3	0.905	0.952	0.656	0.952	0.849
Control Mean	0.15	0.23	0.08	0.15	7.46
Observations	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on migration, estimated using Equations (2, panel A) and (3, panel B). Any migrant is an indicator for any migrant having left the household in the past 12 months. Num Temp Mig. is the number of temporary migrants who left the household in the last 1 months. NFemale and N. Male are the number of temporary female and male migrants, respectively. Remittances is the amount of money remitted by all migrants in the past 30 days in USD. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.15: Effect of the forecast and insurance on crop sales prices

	Panel A: Forecast vs. Insurance					
	(1) Ave. Price	(2) Ave. Price Wt.	(3) Med. Price	(4) Cotton Price	(5) Paddy Price	(6) Maize Price
Forecast	7.13	2.35	12.89*	55.35**	0.31*	-1.11
	(4.76)	(2.74)	(7.69)	(23.74)	(0.16)	(4.05)
Insurance	2.84	-4.39	-0.83	12.36	0.24*	-2.02
	(3.67)	(2.86)	(5.31)	(14.97)	(0.14)	(1.51)
q-val Forecast	0.193	0.254	0.186	0.142	0.156	0.354
q-val Insurance	0.577	0.577	0.779	0.577	0.577	0.577

	Panel B: Forecast Terciles					
Forecast ×	10.69	3.22	6.76	82.55**	0.47	-3.32
Ind Bin 1	(7.43)	(4.51)	(8.04)	(37.45)	(0.33)	(2.58)
Forecast ×	10.11	7.07*	14.46	52.38	0.21	9.82
Ind Bin 2	(6.28)	(3.66)	(12.80)	(33.60)	(0.21)	(10.27)
Forecast ×	-2.09	-5.76	2.87	13.26	0.20	-7.02*
Ind Bin 3	(6.24)	(4.12)	(5.50)	(12.36)	(0.17)	(3.63)
Insurance	2.94	-4.03	-5.79	14.44	0.23	-3.80
	(3.64)	(2.79)	(4.98)	(14.80)	(0.15)	(2.44)
q-val Tercile 1	0.337	0.433	0.433	0.207	0.337	0.337
q-val Tercile 2	0.318	0.318	0.318	0.318	0.318	0.318
q-val Tercile 3	0.745	0.552	0.745	0.552	0.552	0.510
Test Tercile 1=3	0.176	0.132	0.684	0.063	0.463	0.161
Test Insur. = Ter. 3	0.428	0.724	0.172	0.931	0.902	0.221
Control Mean	44.87	32.56	47.81	103.59	24.78	26.66
Observations	818	774	1140	228	509	92

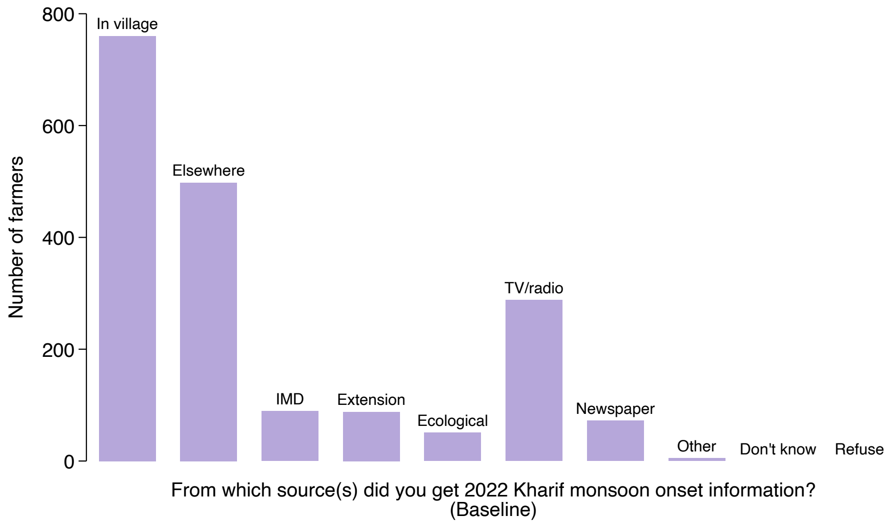
Notes: This table presents estimates of the treatment effects of forecasts and insurance on crop prices, estimated using Equations (2, panel A) and (3, panel B). Ave. Price is the mean sales price over all crops. Ave. Price Wt. is the mean sales price over all crops, weighted by land area. Med. Price is median sales price over all crops in the village (not conditional on growing). Cotton Price, Paddy Price, and Maize Price are the average prices of cotton (if sold). All prices are in USD, and all prices except the median sales price have been winsorized at the 2nd and 98th percentile. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. Sharpened q-values are adjusted across all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A.16: Association between profit and agricultural investment, control group only

	(1) Ag profits (USD)	(2) Ag profits (USD)	(3) Ag profits (USD)	(4) Ag profits (USD)
Ag land (ha)	838.24***	614.20***	628.96***	675.70***
	(128.16)	(136.85)	(152.14)	(70.94)
Cash crop (1/0)	28.93	-244.19	3.53	
	(461.56)	(446.94)	(662.44)	
Total expend. (USD)	-0.67***			
	(0.16)			
Fert. expend. (USD)		-0.03	-0.01	
		(0.72)	(0.77)	
Seed expend. (USD)		-1.30***	-1.29***	-1.38***
		(0.18)	(0.17)	(0.20)
Irri. expend. (USD)		-1.84	-2.12	
		(1.43)	(1.32)	
Labor expend. (USD)		0.27	0.22	
		(0.61)	(0.63)	
Other expend. (USD)		-0.52	-0.42	
		(0.66)	(0.69)	
Controls			X	LASSO
Enum. FE			X	X
Control Mean	1365.46	1365.46	1365.46	1365.46
Observations	474	474	473	474

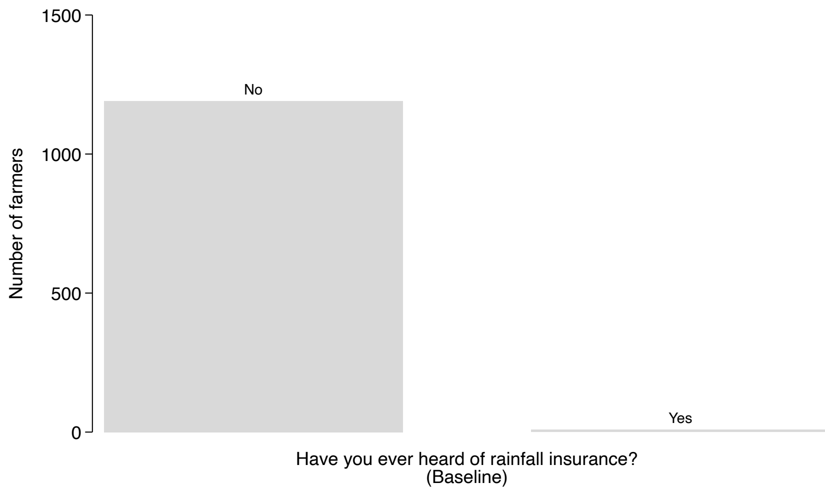
Notes: This table reports correlations between agricultural profits and input use among control farmers only. Column (1) presents correlations between profits, land under cultivation, an indicator for cash cropping, and total input expenditures. Column (2) breaks the input expenditures into categories: spending on fertilizer, seeds, irrigation, labor, and other. Column (3) adds enumerator fixed effects and a series of other controls, including household size, household head education, marriage status, gender, land under cultivation in 2021, indicators for a variety of different crops under cultivation in 2021, district FE, an indicator for the village having above-median farmers per area, and enumerator FE. Column (4) uses a LASSO to select from all variables in Column (3). Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure A.1: Sources of information about the 2022 monsoon at baseline



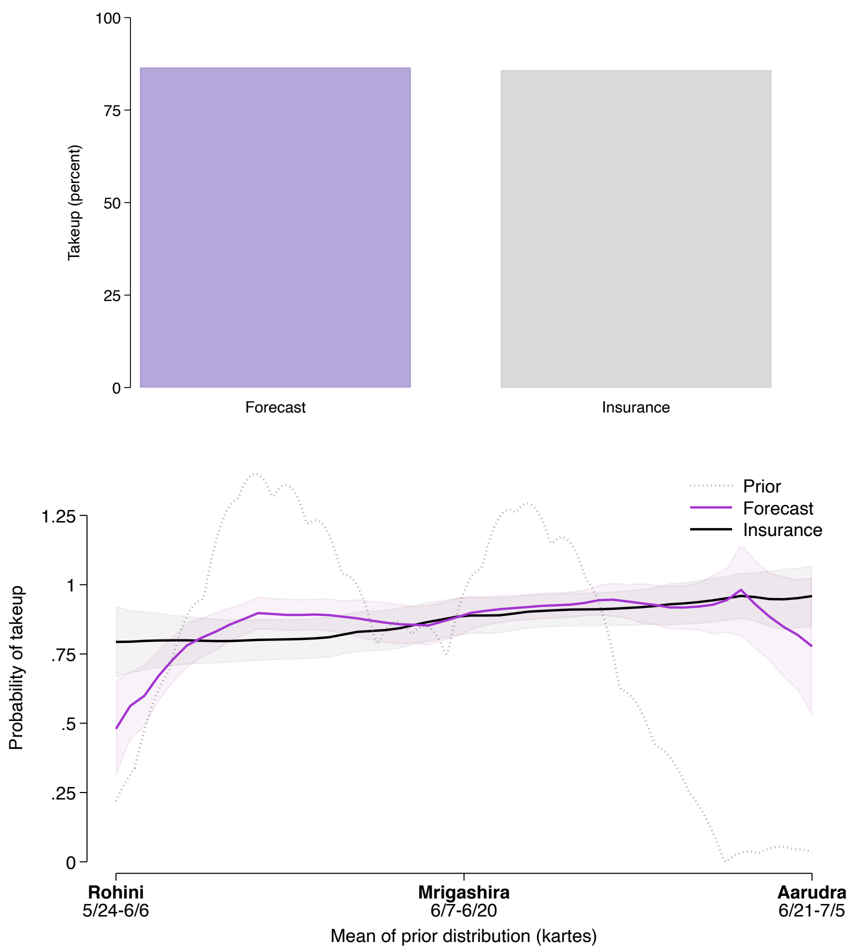
Notes: This figure presents farmers' reported sources of information on monsoon onset timing for the 2022 Kharif season. Data were collected at baseline. Farmers were able to report the use of multiple sources. In village is farmers in the respondent's village; Elsewhere is farmers in other villages; IMD is the government forecast; Extension is other extension services; Ecological is ecological signals (such as animal behavior); TV/radio, Newspaper, Other, Don't know, and Refuse are self-explanatory.

Figure A.2: Baseline knowledge of rainfall insurance



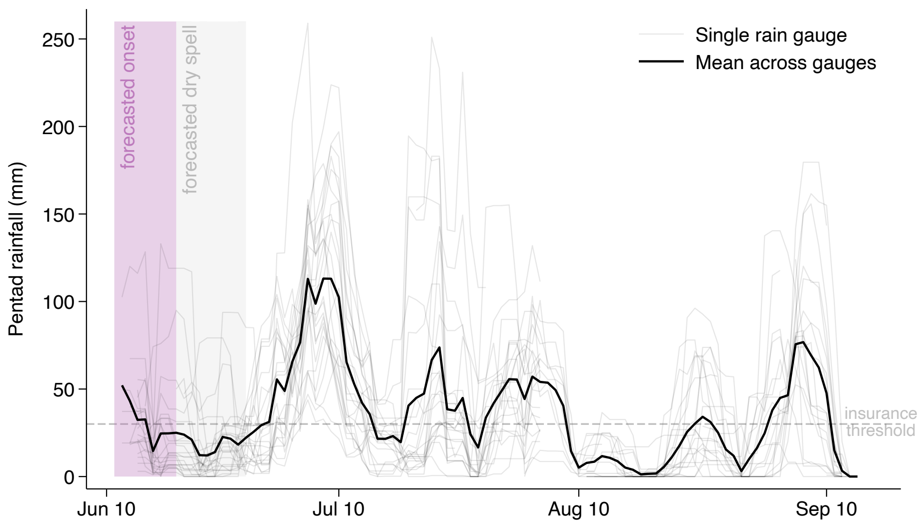
Notes: This figure presents farmers' reported exposure to rainfall insurance at baseline.

Figure A.3: Takeup of forecasts and insurance



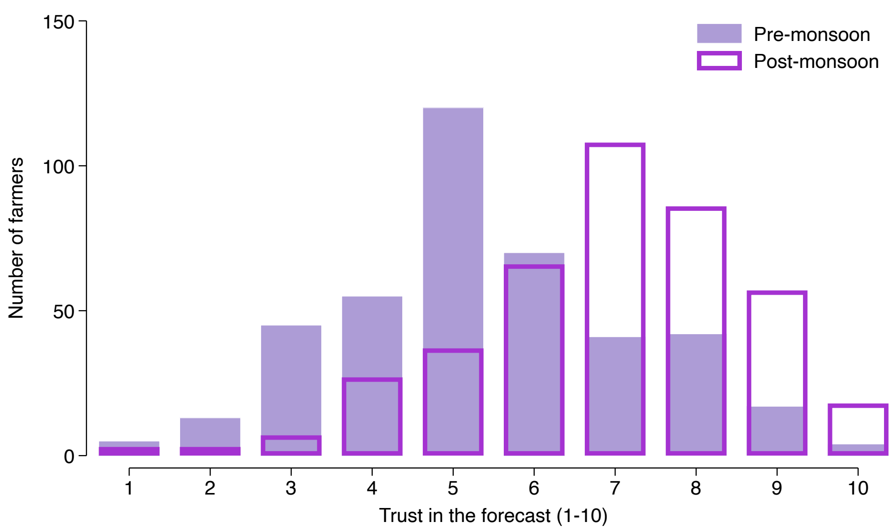
Notes: This figure presents takeup for the forecast (purple) and insurance (gray) products. The top panel shows takeup as a share of households in each treatment arm, while the bottom plots takeup against the mean of the prior distribution, measured in kartes. The dashed line presents the prior distribution. Priors are winsorized at the 3rd and 97th percentile..

Figure A.4: Rainfall realizations and forecast accuracy in our sample



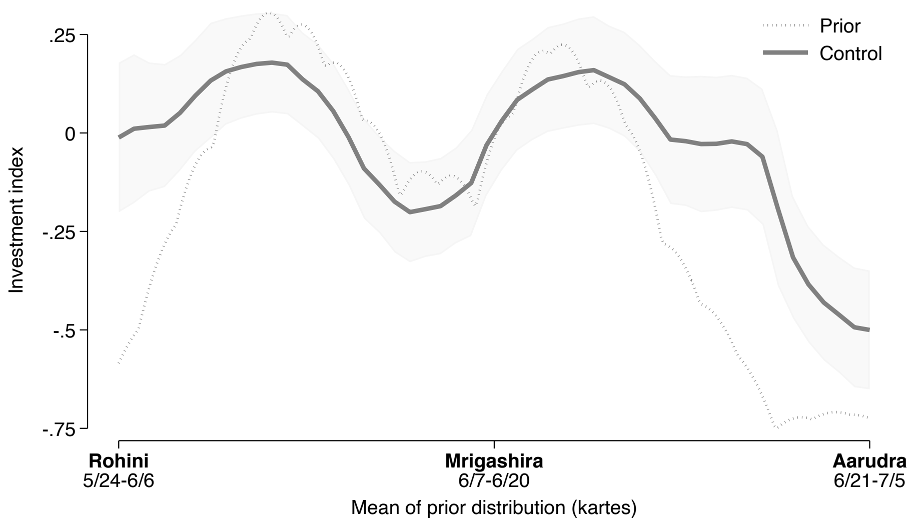
Notes: This figure shows rainfall over our sample. Following standard practice in climate science, each of the 25 light gray lines plots rainfall amounts for one of our sample's gauges calculated in moving cumulative 5-day sums (or pentads). The solid black line plots the mean over all 25 gauges. The purple shaded area shows the monsoon onset window predicted by the forecast, during which time *all* 25 gauges reported non-zero rainfall. The gray shaded area shows the subsequent dry spell predicted by the forecast. Finally, the dashed horizontal line shows the rainfall threshold used to determine insurance payouts. We use a very generous insurance payout rule. Insurance payments were triggered if rainfall had not reached 30mm of precipitation over a 5-day period before the trigger date (and if there was a dry spell within 30 days of the first rains lasting 10 days with less than 5mm of cumulative rainfall). This ensured that as many people as possible would be paid. Using this threshold, 13 out of 25 gauges triggered insurance payouts, even though all of these rain gauges saw rainfall during the forecasted onset period.

Figure A.5: Farmer trust in the forecast



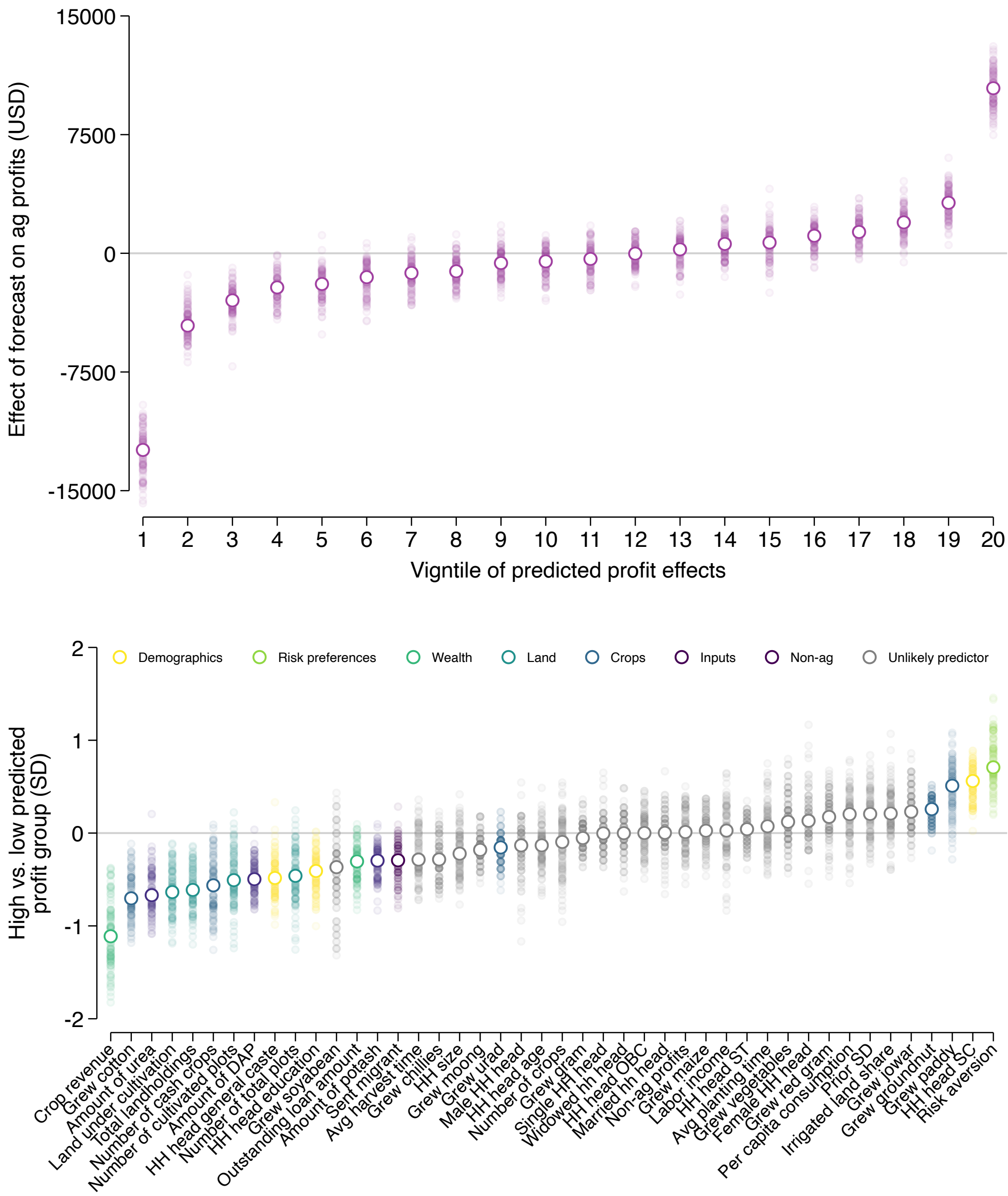
Notes: This figure presents farmers' stated trust in the forecast. The solid histogram presents trust in the forecast when farmers received the information, while the hollow histogram presents trust after the monsoon had arrived.

Figure A.6: Association between control-group priors and agricultural investment



Notes: This figure presents the relationship between investment (measured as an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure) and mean of prior beliefs (elicited using the bean task described in Section 4) in the control group only. The dashed line presents the prior distribution. Priors are winsorized at the 3rd and 97th percentile.

Figure A.7: Generic machine learning: predicted heterogeneity in agricultural profit treatment effects



Notes: This figure plots the results of a generic machine learning approach (Chernozhukov et al. (2023)) for estimating heterogeneous treatment effects of the forecast on agricultural profits. We randomly split the sample 100 times, and for each split, use a random forest algorithm with 100 trees to identify baseline characteristics associated with treatment effect heterogeneity. We use the random forest to generate a predicted treatment effect on agricultural profits for all farmers in the forecast group and control group (which we repeat for each of the 100 splits). In the top panel, we then divide farmers into vigntiles of predicted treatment effect, and compute average realized agricultural profits for forecast and control farmers. Each dot represents the average difference in realized profits for a given split and vigntile. Large circles with white centers plot the median difference within each vigntile. In the bottom panel, we plot the standardized difference between farmers in the highest and lowest quintile of predicted treatment effects for each baseline characteristic used in the random forest. Each dot plots one split for a given covariate. Large circles with white centers plot the median. Colored covariates have at least 90% or more splits above (or below) zero; gray covariates do not.

B Model details

B.1 Setup

In period one, farmers decide how much to save (s), how much to consume (c_1), and how much to invest ($x \geq 0$) by forming expectations across monsoon states ϵ_i and a concave, risky agricultural production technology $f(x, \epsilon_i)$. In the period two, farmers consume (c_2^i) from production and savings. **Production** The output from this production technology is modified by the state of the world ϵ_i for $i \in \{1, ..., S\}$, where ϵ_i are ordered so that for any $i > j$ we have higher production and a greater marginal product: $f(x, \epsilon_i) > f(x, \epsilon_j)$ and $f'(x, \epsilon_i) > f'(x, \epsilon_j)$ for all $x > 0$. There is no product at zero investment regardless of the state: $f(0, \epsilon_i) = 0$ for all i. These states can be thought of as approximations for when the monsoon will arrive, with an earlier arrival being associated with greater returns to investment.[59]

Farmer decisions The farmer's prior belief over the probability distribution of ϵ for the coming agricultural season is given by $G(\cdot)$. They use these beliefs to weight possible future outcomes. The farmer therefore solves the following problem:

$$\begin{aligned} \max_{s,x} \quad & u(c_1) + \beta \textstyle\sum_{i=1}^{S} u(c_2^i | \epsilon_i) g(\epsilon_i) \\ \text{s.t.} \quad & c_1 = y - s - p \cdot x \\ & c_2^i = f(x, \epsilon_i) + s \end{aligned} \tag{B.1}$$

where $u(\cdot)$ is a concave utility function, c_1 is first period consumption, c_2^i is second period consumption in state i, $g(\epsilon_i)$ is the probability density of the farmer's prior over ϵ, y is starting wealth, s is risk-free savings (or interest free borrowing), and p is the price of the input x, and β is the discount factor.

We next turn to optimal farmer behavior, and then study how forecasts and insurance would affect these decisions.

B.2 Optimal farmer investment and saving decisions

We present first-order conditions to illustrate how beliefs affect farmers' decisions.

[59] The investment level x can also be interpreted as a continuum of crop choices, with varying levels of productivity. These productivities depend on the state and are correlated with how expensive each crop is to plant. In that sense, for any given state, there is an optimal crop choice x that would maximize production subject to budget constraints.

Savings The first-order condition for savings s implies the following Euler equation:[60]

$$\beta = \frac{u'(c_1)}{\mathbf{E}[u'(c_2)]} \tag{B.2}$$

where $\mathbf{E}[u'(c_2)]$ is the expected consumption in the second period:

$$\mathbf{E}[u'(c_2)] = \sum_i u'(c_2^i, \epsilon_i) g(\epsilon_i) \tag{B.3}$$

Thus, conditional on investment level x, farmers choose savings such that the ratio of marginal utilities between the first and second period equals the patience parameter (discount factor) β.

Investment The first-order condition for investment x implies that investment prices should equal a weighted marginal product:

$$p = \mathbf{E}[wf'(x)] \tag{B.4}$$

where $\mathbf{E}[wf'(x)]$ is the (weighted) expected marginal product of investment level x:

$$\mathbf{E}[wf'(x)] = \sum_i w(c_1, c_2^i, \epsilon_i) f'(x, \epsilon_i) g(\epsilon_i) \tag{B.5}$$

with weights:

$$w(c_1, c_2^i, \epsilon_i) = \beta \frac{u'(c_2^i, \epsilon_i)}{u'(c_1)} = \frac{u'(c_2^i, \epsilon_i)}{\mathbf{E}[u'(c_2)]} = w(c_2^i, \epsilon_i), \tag{B.6}$$

where the second equality comes from plugging in the FOC for savings in (B.2).

The farmer thus sets investment levels to at expected marginal products over all states, weighting states by their relative marginal utility of consumption. While the investment decision deals with smoothing consumption across states in the second period, the savings decision smooths consumption across periods.

Forecasts Consider first a forecast that shifts beliefs from late G_l to early G'_e. In other words, G'_e puts higher probability ϵ_i for higher i. Suppose the farmer was previously solving the problem with G_l, setting optimal investment levels at x^l:

$$\mathbf{E}_{G_l}[wf'(x^l)] = p \tag{B.7}$$

Conditional on weights w, the previous investment level x^l has larger marginal product under the

[60] The results are qualitatively unchanged with additional constraints that limit borrowing and savings:

$$\underline{s} \leq s \leq \bar{s}$$

new beliefs G'_e:

$$\mathbf{E}_{G'_e}[wf'(x^l)] > \mathbf{E}_{G_l}[wf'(x^l)] = p \tag{B.8}$$

This is because the new beliefs are weighted toward higher states, which have higher marginal product at any x (f' rises with ϵ). To meet the optimal marginal product of p, the farmer must thus lower the marginal product by raising x (f' is concave). Thus, the optimal investment level increases:

$$x^e > x^l \tag{B.9}$$

By symmetry, a forecast that shifts beliefs from early G_e to late G'_l would *decrease* investment levels.

The argument above is conditional on weights w, that capture the relative marginal utility of consumption across states. To the degree farmers are risk averse, they will reduce investment levels x so as to smooth consumption across states. Suppose now that farmers shift beliefs from G_l to G'_e. For any given investment level of x, the farmer's beliefs shift the expected w toward higher states, which have lower marginal utility. While the marginal product is higher in higher states, the weights are higher in lower states. This mechanism would thus *lower* the weighted marginal product $\mathbf{E}_{G'_e}[wf'(x^l)]$ in contrast to the mechanism above. Thus, changes in investment from forecasts are dampened by the degree of risk aversion (concavity of u).

Insurance To incorporate insurance, we now include an additional payout b that occurs in the second period, depending on the state:

$$c_2^i = f(x, \epsilon_i) + s + b \cdot 1\{\epsilon_i \in S_I\},$$

where E is the set of (low) states for which the insurance payout applies. Note that because this additional term is not a function of either investment or savings, the first-order conditions are unchanged.

Under insurance, the following changes occur *ceterus parbius*: for low states, c_2^i increases from the payouts, causing $u'(c_2^i)$ to fall by concavity the weights; for high states, c_2^i is unchanged; on net, $\mathbf{E}[u'(c_2^i)]$ falls. Thus, the weights $w(c_2^i, \epsilon_i)$ in (B.6) will fall for low states (because $u'(c_2^i)$ falls) and rise for high states (because $\mathbf{E}[u'(c_2^i)]$ falls). Intuitively, for the investment decision, farmers now place relatively higher weight on higher states, as insurance allows them to smooth relatively more. Because higher states are more productive, this raises the optimal level of investment.

Note that these effects are heterogeneous. If farmers have *early* priors, they place higher probability weight on *low* states, dampening the above channel. Thus, insurance would cause these farmers to increase investment relatively *less*. In contrast, if farmers have later priors, they will increase investment relatively more in response to insurance.

B.3 Parametrization for simulations

To quantitatively simulate farmer behavior under various counterfactuals, we impose functional form assumptions. **Utility** Farmers' preferences have constant relative risk aversion (CRRA):

$$u(c) = \frac{c^{1-r} - 1}{1 - r} \tag{B.10}$$

Production The technology is Cobb-Douglas in investment:

$$f(x, \epsilon) = \bar{z} \cdot z(\epsilon) \cdot x^{\alpha} \tag{B.11}$$

where $z(\epsilon) \in (0, 1)$ is a (logistic) productivity shock that increases with the state ϵ:

$$z(\epsilon) = \frac{1}{4k} \exp\left(-\frac{\epsilon}{k}\right) \left[1 + \exp\left(-\frac{\epsilon}{k}\right)\right]^{-2} \tag{B.12}$$

The scale parameter k governs how states map into productivity, with lower values driving larger productivity differences across states.

Beliefs and updating The set of possible states S is discrete with 40 possible values $\epsilon_1, \ldots, \epsilon_{40}$. This is distributed according a (rescaled) normal distribution with mean μ and standard deviation parameter σ that is unknown to the farmer:

$$\bar{g}(\epsilon) = \frac{\phi(\epsilon, \mu, \sigma)}{\sum_i \phi(\epsilon_i, \mu, \sigma)} \tag{B.13}$$

where $\phi(., \mu, \sigma)$ is the PDF of a normal distribution. Farmers have (potentially incorrect) prior beliefs with mean μ_p and SD σ_p:

$$g(\epsilon) = \frac{\phi(\epsilon, \mu_p, \sigma_p)}{\sum_i \phi(\epsilon_i, \mu_p, \sigma_p)} \tag{B.14}$$

The forecast distribution is centered around the actual mean μ with SD σ_f that reflects forecast accuracy:

$$h(\epsilon) = \frac{\phi(\epsilon, \mu, \sigma_f)}{\sum_i \phi(\epsilon_i, \mu, \sigma_f)} \tag{B.15}$$

Upon receiving forecast h, the farmer updates from prior g to posterior g' in a Bayesian fashion:

$$g'(\epsilon) = \frac{\phi(\epsilon, \mu', \sigma')}{\sum_i \phi(\epsilon_i, \mu', \sigma')} \tag{B.16}$$

where the posterior mean μ' is a variance-weighted average of the prior and forecast means:

$$\mu' = \frac{\sigma_f^2 \mu_p + \sigma_p^2 \mu}{\sigma_p^2 + \sigma_f^2} \tag{B.17}$$

and the posterior SD σ' scales down the prior in proportion to the (relative) forecast SD:

$$\sigma' = \frac{\sigma_p \sigma_f}{\sqrt{\sigma_p^2 + \sigma_f^2}} \tag{B.18}$$

The parameters are set according to Table B.1 below. Note that we choose parameters such that even the most optimistic farmers believe they face some agriculture risk. This is necessary for the strictly decreasing relationship between insurance treatment effects and priors.

Table B.1: Parameters for model simulation

Parameter	Description	Value
Panel A: Utility Parameters		
r	Relative risk aversion	0.5
β	Discount factor	0.95
y	Starting wealth	5
p	Input price	1
Panel B: Production Parameters		
α	Production function curvature	0.6
$\bar{z}$	Max productivity	3
k	Scale parameter of productivity	2
Panel C: State Parameters		
S	Possible states	$-10, -9.5, -9, \ldots, 9.5, 10$
μ	Mean of actual & forecast distribution	0
σ_f	SD of forecast (accuracy)	2
σ_p	SD of farmer beliefs	5
Panel D: Insurance Parameters		
S_I	States for insurance payout	$-10, -9.5, \ldots, -3.5$
b	Insurance payout	3

C Deviations from our pre-analysis plan

This experiment was pre-registered with the AEA as Trial No. AEARCTR-0008846 and accepted by the *Journal of Development Economics* via pre-results review. We have endeavored to follow the PAP as closely as possible, but have nevertheless had some deviations, which we list here. Changes to regression specifications are noted with footnotes in the main text.

- **Data.** Due to time constraints, we left out several variables from our baseline survey: information on time preferences and intra-household bargaining, both of which we had planned to use in heterogeneity analysis.

- **Data.** Due to time constraints, we left out several variables from our endline survey: information on how much of each planted crop had spoiled, was already consumed, and was stored. We had intended to use these as supplementary outcome measures. We instead focus only on production in this analysis.

- **Outcome variables.** We pre-specified measuring agricultural inputs on a per-acre basis. In the main text, we instead use total expenditure, which we believe better reflects decisions to expand agricultural investment. This is because households ought to make a joint decision to expand land and inputs, maintaining a similar input-to-land ratio. We present results on a per-acre basis in Appendix Table D.9.

- **Outcome variables.** In addition to our pre-specified variables on input expenditure, we add an investment index to Table 3. This is complementary to the q-value approach to dealing with multiple hypotheses, serving as a single summary measure of *ex ante* behavior change. An advantage of the index over the FWER correction is that this index accounts for changes in the *direction* of different measures of investment, while the FWER approach only considers p-values irrespective of sign.

- **Outcome variables.** We pre-specified a comparison between 2022 Kharif crop choice and *planned* 2022 Kharif crop choice (measured at baseline). In the main text, we instead compare 2022 Kharif crop choice to 2021 Kharif crop choice, because this is a revealed preference measure rather than a stated preference measure. We include the stated preference result in Appendix Table D.8 for completeness.

- **Analysis.** For the correlations between WTP and prior beliefs (described in Section 5.1 and presented in Appendix Tables D.5, D.6, and D.7, we erroneously pre-specified a regression equation that included strata fixed effects and controls chosen by double-selection LASSO.

However, these regressions include only a single experimental group at a time (and do not include the control group), meaning that these control variables remove useful variation rather than adding precision. We therefore omit these controls from the tables.

- **Analysis.** For the correlations between WTP and prior beliefs, we had pre-specified a regression that included standard deviation and squared standard deviation of farmers' prior distributions on the right-hand side to test for possible non-linearity in the relationship between WTP and prior strength. Appendix Table D.5 additionally uses the absolute distance between the share of the prior distribution above an on-time cutoff and an early cutoff and 0.5, because we believe this is easier to interpret. For insurance, our theory predicts that WTP strictly falls with an increase in the farmer's belief that the coming year will be good. We therefore use the simple share before the farmer's on-time cutoff and share before the farmer's early cutoff as regressors in Appendix Table D.7, rather than the difference between the shares and 0.5.

- **Analysis.** For the belief change regressions, we pre-specified heterogeneity with respect to multiple measures of prior strength. Here, we present results with respect to prior SD only, as our outcome measures are all relative to the prior or the forecast (and therefore we do not have specific predictions of movement on the basis of binned prior strength).

- **Analysis.** We pre-specified that we would estimate separate treatment effects for forecast farmers receiving bad news vs. bad news. Because the forecast in 2022 was for an average monsoon, there is a large mass of farmers with priors that are very close to the forecast. We therefore estimate treatment effects by *tercile* of prior, which splits the sample into an optimistic group (who receives bad news), an accurate group (who receives neutral news), and a pessimistic group (who receives good news). Given that the forecast itself gave a date range for the monsoon arrival, and that theoretically we would not expect changes in behavior for netural news farmers, we believe our current approach is a better representation of the impact of the forecast on farmer decisions. This avoids the attenuation bias that would be created by including the neutral news group in the good news and bad news groups.

- **Analysis.** We pre-specified that we would estimate heterogeneous treatment effects by the change in belief (absolute difference between prior and posterior). However, this is endogenous and therefore difficult to interpret, so we omit it here.

- **Analysis.** We did not pre-specify heterogeneity on the basis of insurance payouts. However, we find that this is useful to include for the sake of completeness, so we discuss these exploratory results in Section 5.3.1.

D Additional pre-specified results

Table D.1: Effect of the forecast (pooled) and insurance on land use and cropping

	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast	-0.135	0.034	0.008	-0.022	-0.007
	(0.129)	(0.032)	(0.036)	(0.038)	(0.031)
Insurance	0.316*	0.044	0.024	0.034	-0.033
	(0.163)	(0.040)	(0.046)	(0.048)	(0.038)
q-val Forecast	1.000	1.000	1.000	1.000	1.000
q-val Insurance	0.187	0.458	0.724	0.597	0.597

Notes: This table presents estimates of the treatment effects of forecasts and insurance on farmers' land use and cropping decisions, estimated using Equation (3). Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Sharpened q-values are adjusted across all outcomes in Tables D.1 and D.2 (except the index), and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.2: Effect of the forecast (pooled) and insurance on inputs

	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Forecast	-56.62	-94.26	3.00	38.80	-35.49	0.01
	(47.20)	(100.91)	(9.47)	(57.13)	(152.88)	(0.05)
Insurance	83.95	-156.00*	-9.04	200.89***	264.75	0.13**
	(70.75)	(80.20)	(12.15)	(77.88)	(197.81)	(0.06)
q-val Forecast	1.000	1.000	1.000	1.000	1.000	
q-val Insurance	0.458	0.187	0.597	0.112	0.458	
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	1201	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on inputs, estimated using Equation (3). Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor throughout the cropping season. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. It has been excluded from the MHT correction as it is a composite of three outcomes already included. Sharpened q-values are adjusted across all outcomes in Tables D.1 and D.2 (except the index), and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.3: Effect of the forecast (pooled) and insurance on agricultural output

	(1) Prod (Kg)	(2) Crop Sold ($)	(3) Value Prod ($)	(4) Yield	(5) Profit ($)
Forecast	-12.90**	-303.59*	-768.33	-4.03	-488.74
	(5.85)	(173.84)	(638.50)	(2.92)	(385.27)
Insurance	2.51	104.91	-177.61	-3.46	-300.25
	(7.37)	(254.96)	(733.95)	(2.95)	(448.59)
q-val Forecast	0.161	0.194	0.225	0.225	0.225
q-val Insurance	1.000	1.000	1.000	1.000	1.000
Control Mean	66.15	1428.46	5311.78	34.22	1365.46
Observations	1201	1201	1201	1178	1201

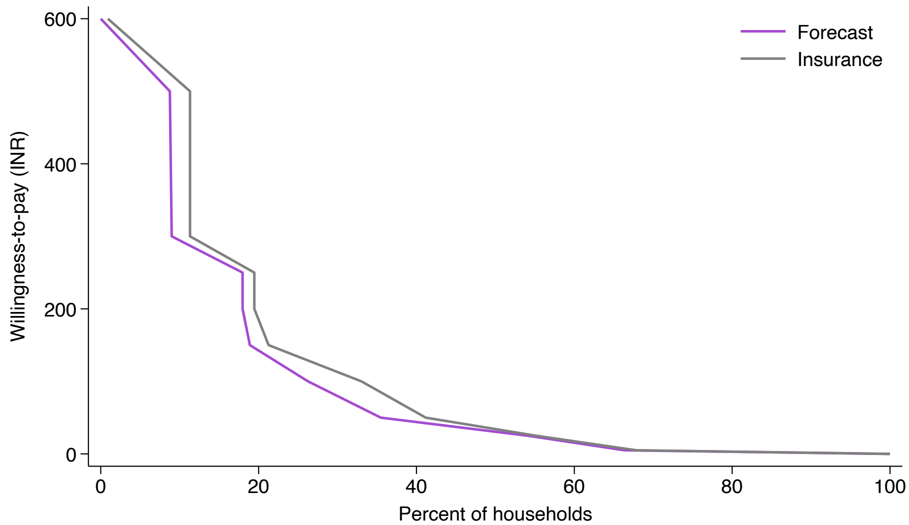
Notes: This table presents estimates of the treatment effects of forecasts and insurance on agricultural output, estimated using Equation (3). Prod (Kg) is total agricultural production in kilograms. Crop sold ($) is the total value of crops that were sold in USD. Value Prod ($) is the value of all crops produced in USD, whether they were sold or not, using median village prices for each crop. Yield is kilograms of production per hectare. Profit is value of production less total expenditures in USD. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted for all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.4: Effect of the forecast (pooled) and insurance on savings, business activity, and welfare

	(1) Net savings	(2) Non-Ag Bus.	(3) Non-Ag Invest	(4) Bus Profit	(5) Cons Per Cap	(6) PhQ
Forecast	208.10	0.01	-0.73	1.91	-1.40	0.12**
	(181.07)	(0.02)	(0.93)	(6.05)	(4.02)	(0.06)
Insurance	-396.47	0.09**	1.61	15.16*	-3.07	0.05
	(295.22)	(0.04)	(1.57)	(8.12)	(4.36)	(0.07)
q-val Forecast	1.000	1.000	1.000	1.000	1.000	0.395
q-val Insurance	0.315	0.178	0.439	0.184	0.474	0.474
Control Mean	-1039.51	0.14	3.30	23.64	40.00	-0.02
Observations	1129	1197	1199	1197	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on welfare, estimated using Equation (3). Net savings is savings less outstanding debt in USD. Non-Ag Bus. is a dummy for owning a non-agricultural business. Non-Ag Invest is investment outside of agriculture in USD. Bus Profit is business profit in USD. Cons per cap is consumption per household member in USD. PhQ is the standardized score of the PHQ-9 screening tool; higher values are worse. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted for all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure D.1: Willingness-to-pay for forecasts and insurance



Notes: This figure presents willingness-to-pay curves for the forecast (purple) and insurance product (gray), elicited using the BDM mechanism described in Section 4 and Appendix G. Mean WTP for the forecast (insurance) is \$1.08 (\$1.29). The area under the demand curve for forecasts (insurance) is \$1.42 (\$1.56).

Table D.5: Correlation between willingness-to-pay for the forecast and priors/risk aversion

	Willingness-to-pay for onset forecast					
	(1)	(2)	(3)	(4)	(5)	(6)
Std. Prior	16.680 (23.907)	183.890 (150.673)				
Std. Prior2		-78.617 (67.695)				
| Share Before On Time Cutoff − 0.5 |			-162.395** (70.287)			
| Share Before Early Cutoff − 0.5|				-200.745** (96.255)		
|Prior − Vg. Historical|					28.392 (23.003)	
Risk Aversion						-0.621 (2.326)
Mean in Forecast Group	88.84	88.84	88.84	88.84	88.84	88.84
Observations	434	434	434	434	434	434

Notes: This table presents the correlation between forecast treatment group farmers' willingness to pay for the forecast and measures of prior strength and risk aversion. Std. Prior is the standard deviation of the farmer's prior as measured at baseline. Std. Prior2 is this SD squared. The absolute value of the share before on time (and early) cutoff minus 0.5, measures the distance between the likelihood a farmer thinks the monsoon is to arrive (at least) on time and 0.5 such that farmers that are more certain the monsoon either will or will not arrive on time will have higher values, while those who are more uncertain will have low values. The variables' range is between 0 and 0.5. The absolute value of the difference between the farmer's prior and the village's historical average measures the distance between the farmer's belief about this year and the average beliefs of past monsoon arrival within the village. Risk Aversion measures the farmer's choice in an incentivized risk game where higher values indicate that the farmer is more risk averse. The sample includes only farmers in the forecast group. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.6: Correlation between willingness-to-pay for the forecast and prior strength terciles

	Willingness-to-pay for onset forecast
	(1)
Std Prior 2nd Tercile	66.014** (27.117)
Std Prior 3rd Tercile	18.260 (18.616)
Mean in Forecast Group	88.84
Observations	434

Notes: This table presents WTP for the forcast by tercile of the standard deviation of farmers' priors. Std. Prior 2nd / 3rd Tercile is an indicator for the respondent's prior standard deviation being in the 2nd or 3rd tercile as measured at baseline. The omitted group is the 1st tercile. The sample includes only farmers in the forecast group. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.7: Correlation between willingness-to-pay for insurance and priors/risk aversion

	Willingness-to-pay for insurance			
	(1)	(2)	(3)	(4)
Stdv of Prior Distribution	37.590 (69.184)			
Prob mass of beans before individual ontime cutoff		32.959 (50.476)		
Prob mass of beans before individual early cutoff			100.737 (98.275)	
Risk Preference - higher is more risk averse				-0.453 (3.826)
Mean in Insurance Group	106.02	106.02	106.02	106.02
Observations	221	221	221	221

Notes: This table presents the correlation between insurance treatment group farmers' willingness to pay for insurance and measures of prior strength and risk aversion. Std. Prior is the standard deviation of the farmer's prior as measured at baseline. Share before On Time/Early cutoff is the respondent's reported probability that the monsoon will arrive on time or early. Risk Aversion measures the farmer's choice in an incentivized risk game where higher values indicate that the farmer is more risk averse. The sample includes only farmers in the insurance group. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, * $p < 0.05$, ** $p < 0.10$.

Table D.8: Effect of the forecast and insurance on additional inputs

	Panel A: Forecast vs. Insurance		
	(1) Changed plans	(2) Early labor	(3) Late labor
Forecast	-0.013	-17.690	58.282
	(0.038)	(25.877)	(36.978)
Insurance	0.013	77.688**	126.971***
	(0.048)	(36.889)	(47.470)
	Panel B: Forecast Terciles		
Forecast × Ind Bin 1	-0.076	-43.713	20.407
	(0.056)	(37.864)	(63.494)
Forecast × Ind Bin 2	0.000	-58.834*	13.057
	(0.054)	(32.220)	(43.423)
Forecast × Ind Bin 3	0.066	59.229	209.947***
	(0.069)	(46.933)	(70.927)
Test Tercile 1=3	0.094	0.082	0.048
Test Insur. = Ter. 3	0.452	0.922	0.167
Control Mean	0.61	355.10	397.97
Observations	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts and insurance on inputs, estimated using Equations (2, panel A) and (3, panel B). Changed plans is an indicator for whether the farmer said they had changed their plans relative to what they said would do in an "on time" monsoon year. Early labor is total labor expenditure on pre-planting and planting activities in USD. Late labor is total labor expenditure between planting and harvest and during harvest in USD. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.9: Effect of the forecast and insurance on inputs per acre

	Panel A: Forecast vs. Insurance				
	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total
Forecast	7.10	-68.79	4.56	54.66**	72.75
	(30.16)	(71.23)	(9.49)	(22.40)	(122.61)
Insurance	23.47	-128.19**	-19.83**	47.83*	-36.86
	(40.48)	(62.84)	(8.13)	(27.92)	(117.10)
q-val Forecast	1.000	1.000	1.000	0.081	1.000
q-val Insurance	0.391	0.091	0.081	0.116	0.432

	Panel B: Forecast Terciles				
Forecast × Ind Bin 1	-48.88	-27.99	-3.94	76.29**	67.60
	(48.67)	(123.45)	(13.61)	(35.81)	(218.97)
Forecast × Ind Bin 2	39.25	-119.64	4.73	31.47	-5.08
	(36.39)	(94.75)	(11.93)	(26.74)	(166.81)
Forecast × Ind Bin 3	47.19	101.52	2.68	34.65	320.39*
	(55.89)	(120.09)	(11.46)	(31.55)	(178.27)
q-val Tercile 1	1.000	1.000	1.000	0.201	1.000
q-val Tercile 2	0.881	0.881	0.881	0.881	0.881
q-val Tercile 3	0.663	0.663	0.994	0.663	0.570
Test Tercile 1=3	0.193	0.437	0.677	0.363	0.363
Test Insur. = Ter. 3	0.739	0.104	0.055	0.802	0.072
Control Mean	288.17	285.39	41.67	391.06	1130.48
Observations	1178	1178	1178	1178	1178

Notes: This table presents estimates of the treatment effects of forecasts and insurance on inputs per acre, estimated using Equations (2, panel A) and (3, panel B). Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor throughout the cropping season, all per acre. Total is the total amount spent on all inputs per acre, including all previous outcomes and any other costs reported by farmers. All outcomes are in USD per acre. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in Tables 2 and 3, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.10: Effect of the forecast on land and crop choice by prior strength

	Panel A: Forecast × Prior Strength				
	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast	-0.136 (0.129)	0.039 (0.032)	0.013 (0.035)	-0.018 (0.037)	-0.001 (0.030)
Forecast × Prior Str.	-0.054 (0.373)	0.033 (0.076)	0.053 (0.095)	-0.042 (0.098)	-0.084 (0.082)
	Panel B: Forecast Terciles × Prior Strength				
Forecast × Ind Bin 1	-0.457** (0.182)	-0.012 (0.049)	-0.031 (0.053)	-0.115** (0.058)	0.000 (0.048)
Forecast × Ind Bin 2	-0.115 (0.179)	0.031 (0.039)	0.035 (0.050)	0.025 (0.047)	0.018 (0.040)
Forecast × Ind Bin 3	0.309 (0.261)	0.156** (0.067)	0.153** (0.063)	0.145** (0.071)	0.024 (0.054)
Forecast × Bin 1 × Prior Str.	-0.005 (0.486)	-0.045 (0.108)	0.051 (0.142)	-0.110 (0.154)	-0.032 (0.118)
Forecast × Bin 2 × Prior Str.	0.578 (0.593)	-0.087 (0.127)	0.056 (0.159)	-0.217 (0.134)	-0.033 (0.137)
Forecast × Bin 3 × Prior Str.	-0.275 (0.681)	-0.025 (0.131)	-0.064 (0.157)	0.173 (0.159)	-0.310** (0.128)
Control Mean	2.18	0.51	0.57	0.36	0.39
Observations	1200	1200	1200	1200	1200

Notes: This table presents estimates of the treatment effects of forecasts on farmers' land use and cropping decisions by prior strength. Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed Crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Added Crop is an indicator for planting an additional crop in 2022 as compared to 2021. Sub Crop is an indicator for removing a crop in 2022 as compared to 2021. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Prior Str. is the difference of the respondent's on-time probability from 0.5. It has been de-meaned. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.11: Effect of the forecast on inputs by prior strength

	Panel A: Forecast × Prior Strength					
	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Forecast	-60.91	-92.33	3.18	40.36	-21.51	0.01
	(47.22)	(103.91)	(9.50)	(57.49)	(154.52)	(0.05)
Forecast × Prior Str.	40.49	-287.61	16.18	-96.55	-315.72	-0.03
	(118.08)	(280.07)	(28.44)	(164.11)	(406.48)	(0.13)

	Panel B: Forecast Terciles × Prior Strength					
Forecast × Ind Bin 1	-143.88*	-73.01	1.32	-3.45	-142.52	-0.10
	(75.26)	(193.97)	(16.24)	(91.43)	(267.64)	(0.08)
Forecast × Ind Bin 2	-59.72	-170.51	-0.84	-64.44	-240.48	-0.01
	(64.02)	(120.28)	(11.41)	(68.78)	(193.49)	(0.06)
Forecast × Ind Bin 3	69.36	142.40	20.02	274.19**	655.51***	0.28***
	(74.41)	(132.75)	(15.00)	(110.79)	(239.44)	(0.10)
Forecast × Bin 1 × Prior Str.	134.90	-536.15	60.98	-258.14	-695.52	-0.14
	(184.33)	(559.79)	(41.08)	(216.78)	(712.22)	(0.19)
Forecast × Bin 2 × Prior Str.	-45.14	-13.88	1.03	237.10	434.63	0.03
	(204.66)	(361.95)	(36.73)	(243.11)	(626.18)	(0.20)
Forecast × Bin 3 × Prior Str.	216.70	-397.00	-39.34	165.11	-21.89	-0.08
	(168.99)	(315.20)	(41.15)	(298.65)	(606.44)	(0.24)
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	1200	1200	1200	1200	1200	1200

Notes: This table presents estimates of the treatment effects of forecasts on farmers' input use by prior strength. Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Prior Str. is the difference of the respondent's on-time probability from 0.5. It has been de-meaned. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.12: Effect of the forecast on land and crop choice by gap between forecast and prior

	Panel A: Forecast × Risk Aversion				
	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast	-0.154 (0.136)	0.036 (0.032)	0.003 (0.036)	-0.019 (0.039)	-0.010 (0.031)
Forecast × Diff. Prior and Forecast.	0.157 (0.150)	0.009 (0.029)	-0.002 (0.036)	-0.003 (0.040)	-0.015 (0.028)

	Panel B: Forecast Terciles × Risk Aversion				
Forecast × Ind Bin 1	-0.364 (0.237)	0.050 (0.061)	-0.009 (0.076)	-0.043 (0.082)	-0.034 (0.060)
Forecast × Ind Bin 2	0.435 (0.386)	-0.020 (0.092)	0.151 (0.113)	0.179 (0.112)	-0.034 (0.084)
Forecast × Ind Bin 3	0.069 (0.272)	0.133** (0.068)	0.124* (0.063)	0.121* (0.073)	0.033 (0.060)
Forecast × Bin 1 × Prior. - Fore.	-0.349 (0.233)	-0.097* (0.059)	-0.044 (0.088)	-0.148* (0.089)	0.080 (0.063)
Forecast × Bin 2 × Prior. - Fore.	0.743* (0.413)	-0.058 (0.107)	0.151 (0.128)	0.227* (0.130)	-0.068 (0.096)
Forecast × Bin 3 × Prior. - Fore.	0.362 (0.288)	0.002 (0.043)	0.048 (0.071)	0.030 (0.066)	-0.004 (0.052)
Control Mean	2.18	0.51	0.57	0.36	0.39
Observations	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts on farmers' land use and cropping decisions by the gap between the forecast and the prior. Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed Crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Added Crop is an indicator for planting an additional crop in 2022 as compared to 2021. Sub Crop is an indicator for removing a crop in 2022 as compared to 2021. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Prior. - Fore. is the standardized absolute difference between the prior and the forecast. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.13: Effect of the forecast on inputs by gap between forecast and prior

	Panel A: Forecast × Risk Aversion					
	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Forecast	-53.71	-91.91	3.34	53.18	-29.05	0.00
	(48.64)	(104.56)	(9.65)	(59.72)	(158.34)	(0.05)
Forecast × Diff. Prior and Forecast.	18.12	-28.64	4.63	112.98*	121.83	0.05
	(43.11)	(87.23)	(9.03)	(65.87)	(144.62)	(0.05)

	Panel B: Forecast Terciles × Risk Aversion					
Forecast × Ind Bin 1	-93.67	239.86	-15.22	109.63	285.62	0.03
	(95.60)	(327.09)	(20.43)	(116.40)	(397.95)	(0.10)
Forecast × Ind Bin 2	161.26	-140.22	-15.34	47.24	119.94	0.11
	(137.06)	(181.49)	(21.61)	(163.90)	(379.71)	(0.14)
Forecast × Ind Bin 3	37.85	129.67	19.74	204.22*	519.14*	0.19*
	(87.49)	(168.27)	(17.97)	(110.34)	(301.90)	(0.11)
Forecast × Bin 1 × Prior. - Fore.	-102.96	-487.32*	21.19	-258.94**	-876.15**	-0.27***
	(130.27)	(283.00)	(23.55)	(128.60)	(363.75)	(0.09)
Forecast × Bin 2 × Prior. - Fore.	281.30*	9.14	-15.84	159.50	461.74	0.18
	(151.75)	(161.26)	(27.10)	(187.53)	(429.88)	(0.16)
Forecast × Bin 3 × Prior. - Fore.	20.94	8.13	8.44	122.14	229.29	0.09
	(58.57)	(83.68)	(9.07)	(132.15)	(198.53)	(0.09)
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	1201	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts on farmers' inputs by the gap between the forecast and the prior. Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Prior. - Fore. is the standardized absolute difference between the prior and the forecast. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.14: Effect of the forecast on land and crop choice by WTP

	Panel A: Forecast × Risk Aversion				
	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast	-0.319**	-0.013	-0.033	-0.050	0.012
	(0.153)	(0.042)	(0.048)	(0.046)	(0.036)
Forecast × WTP	-0.136	-0.007	-0.011	-0.044	-0.004
	(0.114)	(0.035)	(0.052)	(0.045)	(0.037)
WTP	-0.006	-0.003	0.021	0.028	0.037
	(0.094)	(0.031)	(0.048)	(0.038)	(0.034)
	Panel B: Forecast Terciles × Risk Aversion				
Forecast × Ind Bin 1	-0.827***	-0.032	-0.038	-0.122*	0.082
	(0.271)	(0.068)	(0.075)	(0.071)	(0.061)
Forecast × Ind Bin 2	-0.178	-0.063	-0.048	-0.050	0.030
	(0.195)	(0.056)	(0.077)	(0.066)	(0.057)
Forecast × Ind Bin 3	0.237	0.140	0.053	0.049	-0.016
	(0.323)	(0.092)	(0.077)	(0.090)	(0.076)
Forecast × Bin 1 × WTP	-0.071	-0.001	-0.097	-0.152*	0.024
	(0.220)	(0.069)	(0.091)	(0.087)	(0.072)
Forecast × Bin 2 × WTP	-0.261**	-0.022	-0.003	-0.033	-0.025
	(0.130)	(0.046)	(0.057)	(0.053)	(0.044)
Forecast × Bin 3 × WTP	0.083	0.068	0.106	0.010	0.125
	(0.285)	(0.091)	(0.091)	(0.097)	(0.082)
Control Mean	2.18	0.51	0.57	0.36	0.39
Observations	655	655	655	655	655

Notes: This table presents estimates of the treatment effects of forecasts on farmers' land use and cropping decisions by WTP. Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed Crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Added Crop is an indicator for planting an additional crop in 2022 as compared to 2021. Sub Crop is an indicator for removing a crop in 2022 as compared to 2021. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. WTP is the willingness-to-pay for the forecast and insurance product. The sample excludes the control group because WTP is undefined for them. The omitted category is insurance. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.15: Effect of the forecast on inputs by WTP

	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Panel A: Forecast × Risk Aversion						
Forecast	-100.52	70.36	13.60	-115.03	-146.28	-0.07
	(73.69)	(75.93)	(13.16)	(85.65)	(187.74)	(0.07)
Forecast × WTP	-45.04	28.25	4.79	-19.60	27.83	-0.01
	(76.38)	(59.66)	(9.88)	(68.04)	(167.15)	(0.05)
WTP	75.02	11.43	-3.41	50.77	91.50	-0.00
	(82.46)	(29.03)	(7.44)	(72.02)	(170.28)	(0.05)
Panel B: Forecast Terciles × Risk Aversion						
Forecast × Ind Bin 1	-246.75**	63.08	10.51	-145.82	-409.59	-0.20**
	(106.12)	(192.81)	(28.76)	(111.43)	(335.84)	(0.10)
Forecast × Ind Bin 2	-114.31	2.59	3.21	-213.05**	-289.13	-0.11
	(87.10)	(72.93)	(14.52)	(105.92)	(220.58)	(0.09)
Forecast × Ind Bin 3	73.21	178.13	36.88*	158.75	401.80	0.25*
	(125.02)	(124.05)	(20.49)	(177.93)	(359.59)	(0.14)
Forecast × Bin 1 × WTP	-148.04	-36.20	18.89	-125.33	-305.65	-0.02
	(116.29)	(101.16)	(20.15)	(113.43)	(292.17)	(0.10)
Forecast × Bin 2 × WTP	36.18	-12.44	0.16	33.20	98.79	-0.04
	(72.21)	(35.09)	(12.49)	(70.25)	(145.95)	(0.06)
Forecast × Bin 3 × WTP	3.99	163.30	-5.37	128.95	416.69	0.13
	(83.18)	(210.96)	(18.01)	(176.43)	(399.98)	(0.14)
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	655	655	655	655	655	655

Notes: This table presents estimates of the treatment effects of forecasts on farmers' land use and cropping decisions by WTP. Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. WTP is the willingness-to-pay for the forecast and insurance product. The sample excludes the control group because WTP is undefined for them. The omitted category is insurance. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.16: Effect of the forecast on land use and crop choice by risk aversion

	Panel A: Forecast × Risk Aversion				
	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast	-0.410***	0.013	0.030	-0.048	0.032
	(0.158)	(0.037)	(0.043)	(0.043)	(0.035)
Forecast × Risk Av.	0.640***	0.045	-0.050	0.051	-0.093*
	(0.240)	(0.061)	(0.064)	(0.070)	(0.056)
	Panel B: Forecast Terciles × Risk Aversion				
Forecast × Ind Bin 1	-0.599***	-0.042	-0.024	-0.135*	0.052
	(0.224)	(0.054)	(0.065)	(0.069)	(0.052)
Forecast × Ind Bin 2	-0.270	0.015	0.025	-0.020	0.035
	(0.214)	(0.048)	(0.061)	(0.056)	(0.046)
Forecast × Ind Bin 3	-0.065	0.139	0.166**	0.065	0.041
	(0.285)	(0.086)	(0.071)	(0.075)	(0.070)
Forecast × Bin 1 × Risk Av.	0.334	0.086	-0.003	0.034	-0.076
	(0.296)	(0.084)	(0.093)	(0.099)	(0.070)
Forecast × Bin 2 × Risk Av.	0.411	0.036	0.019	0.056	-0.040
	(0.303)	(0.067)	(0.085)	(0.084)	(0.071)
Forecast × Bin 3 × Risk Av.	0.914*	0.061	-0.018	0.149	-0.013
	(0.469)	(0.120)	(0.104)	(0.128)	(0.099)
Control Mean	2.18	0.51	0.57	0.36	0.39
Observations	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts on farmers' inputs by the risk aversion. Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed Crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Added Crop is an indicator for planting an additional crop in 2022 as compared to 2021. Sub Crop is an indicator for removing a crop in 2022 as compared to 2021. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Risk. Av. is the result of an incentivized risk game. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.17: Effect of the forecast on inputs by risk aversion

	Panel A: Forecast × Risk Aversion					
	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Forecast	-36.37	-1.02	1.11	-8.06	27.86	-0.04
	(64.47)	(124.06)	(10.10)	(72.16)	(188.43)	(0.06)
Forecast × Risk Av.	-68.48	-259.31*	2.90	128.39	-170.10	0.12
	(94.47)	(153.01)	(19.19)	(102.68)	(278.40)	(0.09)
	Panel B: Forecast Terciles × Risk Aversion					
Forecast × Ind Bin 1	52.87	68.59	18.46	-21.27	134.70	-0.12
	(96.24)	(243.14)	(19.99)	(118.04)	(363.98)	(0.09)
Forecast × Ind Bin 2	-95.58	-110.48	-12.59	-156.86*	-341.65	-0.06
	(77.77)	(149.32)	(12.32)	(82.87)	(230.58)	(0.08)
Forecast × Ind Bin 3	-34.21	298.39	-2.88	152.92	471.99	0.20
	(86.02)	(224.17)	(9.91)	(120.21)	(304.20)	(0.12)
Forecast × Bin 1 × Risk Av.	-478.98***	-386.47*	-43.06	-1.92	-868.61**	0.00
	(133.50)	(202.94)	(36.70)	(133.54)	(371.07)	(0.11)
Forecast × Bin 2 × Risk Av.	154.09	-146.01	30.29	281.70**	465.01	0.15
	(119.25)	(151.67)	(20.23)	(116.11)	(307.26)	(0.11)
Forecast × Bin 3 × Risk Av.	245.77*	-275.35	62.81*	262.30	450.12	0.24
	(142.57)	(279.02)	(33.79)	(209.59)	(472.61)	(0.18)
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	1201	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecasts on farmers' inputs by the risk aversion. Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. Risk. Av. is the result of an incentivized risk game. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.18: Effect of insurance on inputs by prior terciles

	Panel A: Forecast vs. Insurance			
	(1) Land Ha.	(2) Cash Crop	(3) Total Inputs	(4) Invest Index
Insurance × Ind Bin 1	0.621** (0.278)	0.011 (0.064)	383.365 (326.854)	0.175* (0.099)
Insurance × Ind Bin 2	0.138 (0.194)	0.073 (0.050)	168.354 (234.993)	0.114 (0.076)
Insurance × Ind Bin 3	-0.091 (0.350)	0.029 (0.083)	198.858 (344.681)	0.060 (0.136)
q-val Insure Ter. 1	0.084	0.567	0.318	
q-val Insure Ter. 2	0.768	0.768	0.768	
q-val Insure Ter. 3	1.000	1.000	1.000	
Test Tercile 1=3	0.114	0.857	0.682	0.479
Control Mean	2.18	0.51	1948.48	0.00
Observations	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of insurance on farmers' inputs by prior belief. Land Ha. is cultivated land in hectares. Cash crop is an indicator for growing at least one cash crop. Total inputs is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers, in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. It has been excluded from the MHT correction as it is a composite of three outcomes already included. Bins 1–3 indicate the prior tercile for a respondent. Prior tercile 1 were the most optimistic. Prior bin 2 had average (correct) beliefs. Prior bin 3 were the most pessimistic. Sharpened q- values are adjusted across all outcomes shown (except the index), and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.19: Effect of forecast and insurance takeup on beliefs

	(1) $\mid$ posterior − forecast $\mid$	(2) $\mid$ posterior − prior $\mid$	(3) K-S Stat
Forecast takeup	-0.178* (0.099)	-0.245** (0.113)	-0.060* (0.033)
Insurance takeup	0.044 (0.134)	-0.067 (0.149)	-0.019 (0.040)
Control Mean	0.70	0.89	0.44
Observations	921	921	921

Notes: This table presents estimates of the treatment effects of forecast and insurance take-up on farmers' beliefs about the onset timing of the Indian Summer Monsoon, estimated using an IV version of Equation (2) where we instrument for forecast and insurance takeup with an indicator for being in a forecast or insurance village. To compute priors and posteriors, we use the beans task described in Section 4. |posterior - forecast| is the absolute difference between a respondent's posterior and the forecast date for the monsoon onset. |posterior - prior| is the absolute difference between a respondent's prior and posterior belief for when the monsoon will arrive. K-S Stat is the Kolmogorov–Smirnov test statistic for the difference between a respondent's prior distribution and their posterior distribution. We exclude households where we were unable to speak to the same respondent when eliciting priors and posteriors. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, ** $p < 0.10$.

Table D.20: Effect of forecast and insurance takeup on land use and cropping

	(1) Land Ha.	(2) Cash Crop	(3) Changed Crop	(4) Added Crop	(5) Sub Crop
Forecast takeup	-0.589**	-0.013	-0.038	-0.137**	0.003
× Ind Bin 1	(0.235)	(0.058)	(0.065)	(0.070)	(0.058)
Forecast takeup	-0.113	0.025	0.033	0.007	0.010
× Ind Bin 2	(0.194)	(0.043)	(0.056)	(0.052)	(0.044)
Forecast takeup	0.272	0.161**	0.148**	0.156**	0.023
× Ind Bin 3	(0.292)	(0.073)	(0.067)	(0.076)	(0.062)
Insurance takeup	0.335*	0.055	0.036	0.049	-0.019
	(0.196)	(0.045)	(0.054)	(0.057)	(0.042)
q-val Tercile 1	0.139	1.000	1.000	0.173	1.000
q-val Tercile 2	1.000	1.000	1.000	1.000	1.000
q-val Tercile 3	0.244	0.060	0.060	0.069	0.396
Test Tercile 1=3	0.022	0.051	0.041	0.003	0.803
Test Insur. = Ter. 3	0.848	0.185	0.141	0.202	0.534
Control Mean	2.18	0.51	0.57	0.36	0.39
Observations	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecast and insurance takeup on farmers' land use and cropping decisions, estimated using an IV version of Equation (3) where we instrument for forecast and insurance takeup with indicators for being in a forecast or insurance village. Land Ha. is area cultivated, measured in hectares. Cash Crop is an indicator for the farmer planting at least one cash crop. Changed crop is an indicator for planting a different crop mix in the 2022 Kharif season than the farmer planted during the 2021 Kharif season. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in Tables 2 and 3 (except the index), and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.21: Effect of forecast and insurance takeup on inputs

	(1) Fert	(2) Seed	(3) Irri	(4) Labor	(5) Total	(6) Invest Index
Forecast takeup	-180.05*	-78.19	-0.61	-9.40	-241.09	-0.14
× Ind Bin 1	(92.81)	(242.38)	(20.48)	(112.41)	(340.49)	(0.09)
Forecast takeup	-65.54	-180.17	-1.29	-59.45	-234.79	-0.02
× Ind Bin 2	(70.44)	(140.39)	(12.96)	(77.41)	(222.19)	(0.07)
Forecast takeup	78.79	157.12	25.82	322.73***	754.43***	0.28**
× Ind Bin 3	(83.16)	(180.23)	(18.62)	(118.55)	(289.64)	(0.11)
Insurance takeup	85.56	-135.31	-10.88	182.62**	299.95	0.15*
	(79.91)	(88.15)	(12.38)	(87.26)	(224.44)	(0.07)
q-val Tercile 1	0.187	1.000	1.000	1.000	1.000	
q-val Tercile 2	1.000	1.000	1.000	1.000	1.000	
q-val Tercile 3	0.271	0.271	0.160	0.049	0.049	
Test Tercile 1=3	0.031	0.434	0.345	0.045	0.025	0.003
Test Insur. = Ter. 3	0.947	0.106	0.070	0.329	0.173	0.284
Control Mean	492.51	434.41	54.05	761.96	1948.48	0.00
Observations	1201	1201	1201	1201	1201	1201

Notes: This table presents estimates of the treatment effects of forecast and insurance takeup on inputs, estimated using an IV version of Equation (3) where we instrument for forecast and insurance takeup with indicators for being in a forecast or insurance village. Fert is the amount spend on fertilizer, Seeds the amount spent on seeds, Irri the amount spent on irrigation, and Labor the amount spent on labor throughout the cropping season. Total is the total amount spent on all inputs, including all previous outcomes and any other costs reported by farmers. All outcomes in Columns 1–5 are in USD. Invest Index is an inverse covariance weighted index of land cultivated, cash crop cultivation, and total input expenditure. It has been excluded from the MHT correction as it is a composite of three outcomes already included. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. Sharpened q-values are adjusted across all outcomes in Tables 2 and 3 (except the index), and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table D.22: Effect of forecast and insurance takeup on agricultural output

	(1) Prod (Kg)	(2) Crop Sold ($)	(3) Value Prod ($)	(4) Yield	(5) Profit ($)
Forecast takeup	-21.37**	-334.76	-2199.76**	-8.03	-1466.30**
× Ind Bin 1	(9.95)	(304.90)	(1073.81)	(5.27)	(713.82)
Forecast takeup	-15.62*	-512.78*	-159.88	-1.83	105.00
× Ind Bin 2	(9.02)	(286.30)	(1082.15)	(4.33)	(611.64)
Forecast takeup	16.24	-82.35	74.35	3.62	-715.93
× Ind Bin 3	(11.80)	(310.29)	(947.02)	(4.11)	(577.77)
Insurance takeup	5.92	102.93	5.36	-2.39	-261.20
	(8.19)	(271.72)	(798.45)	(3.20)	(507.57)
q-val Tercile 1	0.073	0.123	0.073	0.073	0.073
q-val Tercile 2	0.264	0.264	1.000	1.000	1.000
q-val Tercile 3	1.000	1.000	1.000	1.000	1.000
Test Tercile 1=3	0.009	0.548	0.095	0.050	0.383
Test Insur. = Ter. 3	0.405	0.573	0.943	0.183	0.424
Control Mean	66.15	1428.46	5311.78	34.22	1365.46
Observations	1201	1201	1201	1178	1201

Notes: This table presents estimates of the treatment effects of forecast and insurance takeup on agricultural output, estimated using an instrumental variables version of Equation (3) where we use an indicator for being in a forecast or insurance offer village as an instrument for forecast or insurance takeup. Prod (Kg) is total agricultural production in kilograms. Crop sold ($) is the total value of crops that were sold in USD. Value Prod ($) is the value of all crops produced in USD, whether they were sold or not, using median village prices for each crop. Yield is kilograms of production per hectare. Profit is value of production less total expenditures in USD. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. Sharpened q-values are adjusted for all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

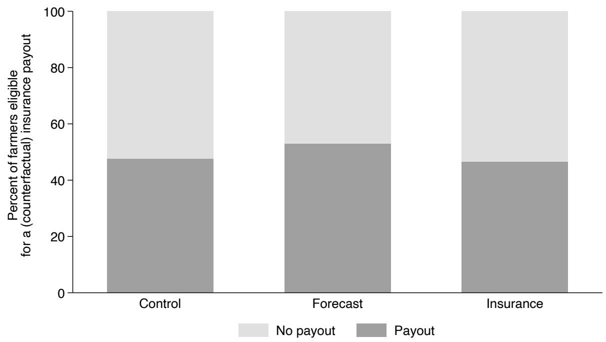
Table D.23: Effect of the forecast and insurance takeup on savings, business activity, and welfare

	(1) Net savings	(2) Non-Ag Bus.	(3) Non-Ag Invest	(4) Bus Profit	(5) Cons Per Cap	(6) PhQ
Forecast takeup	651.41*	0.06	0.46	13.08	-6.34	0.20**
× Ind Bin 1	(353.84)	(0.05)	(1.96)	(13.56)	(8.85)	(0.10)
Forecast takeup	-11.50	0.01	0.14	2.38	-0.32	0.07
× Ind Bin 2	(266.99)	(0.04)	(1.37)	(7.54)	(6.28)	(0.08)
Forecast takeup	206.88	-0.06	-2.44	-4.05	2.61	0.06
× Ind Bin 3	(354.01)	(0.05)	(1.49)	(13.25)	(4.85)	(0.15)
Insurance takeup	-477.24	0.11***	2.23	17.64*	-3.05	0.02
	(306.13)	(0.04)	(1.56)	(9.28)	(4.86)	(0.06)
q-val Tercile 1	0.246	0.452	0.875	0.504	0.611	0.246
q-val Tercile 2	1.000	1.000	1.000	1.000	1.000	1.000
q-val Tercile 3	1.000	1.000	1.000	1.000	1.000	1.000
Test Tercile 1=3	0.379	0.083	0.240	0.361	0.367	0.409
Test Insur. = Ter. 3	0.072	0.005	0.004	0.174	0.334	0.812
Control Mean	-1039.51	0.14	3.30	23.64	40.00	-0.02
Observations	1129	1197	1199	1197	1201	1201

Notes: This table presents estimates of the treatment effects of forecast and insurance takeup on welfare, estimated using an instrumental variables version of Equation (3) where we use an indicator for being in a forecast or insurance offer village as an instrument for forecast or insurance takeup. Net savings is savings less outstanding debt in USD. Non-Ag Bus. is a dummy for owning a non-agricultural business. Non-Ag Invest is investment outside of agriculture in USD. Bus Profit is business profit in USD. Cons per cap is consumption per household member in USD. PhQ is the standardized score of the PHQ-9 screening tool; higher values are worse. Bins 1–3 indicate the prior tercile for a respondent. Prior bin 1 were the most optimistic, and received bad news. Prior bin 2 had their beliefs more or less confirmed, receiving neutral news. Prior bin 3 received good news. "Test Tercile 1 = 3" is the p-value on the test of equality between the first and third coefficient; "Test Insur. = Ter. 3" is the p-value for the test of equality between the third and fourth coefficient. All regressions include strata fixed effects and baseline controls chosen by double-selection LASSO. Sharpened q-values are adjusted for all outcomes in the table, and standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

E Additional exploratory results

Figure E.1: Share of households eligible for (counterfactual) insurance payouts



Notes: This figure shows the share of farmers in each treatment group whose rainfall realization (would have) made them eligible for an insurance payout in the insurance treatment arm. 115 of 247 insurance farmers were in payout-eligible villages. Of these, 94 farmers received payouts (the remaining 21 farmers did not purchase the insurance product). All farmers who received payouts received the medium payout of 9,100 INR.

Table E.1: Effect of insurance on agricultural output by payout

	(1) Prod (Kg)	(2) Crop Sold ($)	(3) Value Prod ($)	(4) Yield	(5) Profit ($)
(Counterfactual) insurance payout Y/N	-0.20	-96.12	373.52	-6.46	329.86
	(10.28)	(231.07)	(867.64)	(5.57)	(523.77)
Insurance	-0.54	-157.40	-888.68	-3.68	-517.41
	(8.80)	(270.21)	(868.88)	(4.17)	(490.13)
Insurance payout Y/N	9.26	551.18	1353.72	1.07	415.60
	(12.53)	(456.34)	(1260.91)	(4.62)	(793.63)
Forecast	-10.98*	-308.64*	-1017.71*	-3.03	-616.54*
	(5.63)	(160.32)	(564.71)	(2.80)	(357.35)
Payout effect	8.719	393.781	465.039	-2.604	-101.814
p-value Payout effect	0.403	0.312	0.657	0.440	0.885
Control Mean	66.15	1428.46	5311.78	34.22	1365.46
Observations	1201	1201	1201	1178	1201

Notes: This table presents estimates of the treatment effects of insurance on agricultural output by insurance payout eligibility. Prod (Kg) is total agricultural production in kilograms. Crop sold ($) is the total value of crops that were sold in USD. Value Prod ($) is the value of all crops produced in USD, whether they were sold or not, using median village prices for each crop. Yield is kilograms of production per hectare. Profit is value of production less total expenditures in USD. Payout eligible indicates that a village would have been eligible to receive a payout in the insurance treatment arm. Payout effect is the treatment effect for payout-eligible households in the insurance group, with the p-value shown in the row below. All regressions include strata FE and controls selected by double-selection LASSO. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table E.2: Effect of insurance on savings, business activity, and welfare by payout

	(1) Net savings	(2) Non-Ag Bus.	(3) Non-Ag Invest	(4) Bus Profit	(5) Cons Per Cap	(6) PhQ
(Counterfactual) insurance payout Y/N	-102.45	0.01	-0.69	8.46	-1.30	0.02
	(286.01)	(0.03)	(1.29)	(7.97)	(5.87)	(0.06)
Insurance	-4.44	0.09*	-1.53	17.19	-1.21	0.03
	(230.10)	(0.05)	(1.02)	(10.83)	(5.48)	(0.06)
Insurance payout (Y/N)	-774.32	-0.04	7.01**	-7.27	-3.58	-0.01
	(588.02)	(0.07)	(2.87)	(16.21)	(6.93)	(0.10)
Forecast	293.88*	0.01	-0.52	2.42	-2.32	0.09*
	(175.50)	(0.03)	(0.92)	(6.15)	(4.05)	(0.05)
Payout effect	-778.762	0.057	5.480	9.922	-4.788	0.026
p-value Payout effect	0.162	0.292	0.050	0.423	0.398	0.774
Control Mean	-1039.51	0.14	3.30	23.64	40.00	-0.02
Observations	1129	1197	1199	1197	1201	1201

Notes: This table presents estimates of the treatment effects of insurance on welfare by insurance payout eligibility. Cons per cap is consumption per household member in USD. PhQ is the standardized score of the PHQ-9 screening tool; higher values are worse. Payout eligible indicates that a village would have been eligible to receive a payout in the insurance treatment arm. Payout effect is the treatment effect for payout-eligible households in the insurance group, with the p-value shown in the row below. All regressions include strata FE and controls selected by double-selection LASSO. Standard errors are clustered at the village level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

F Seasonal climate forecasts

There are two aspects of the Indian Summer Monsoon (ISM) that researchers have attempted to forecast: quantity and timing. The ideal seasonal forecast for an Indian farmer would provide local-level information on the timing (onset) *and* quantity of monsoon rainfall with enough advance notice (e.g., greater than a month) to make decisions about labor and crop inputs. However, from the point of view of the forecaster, timing and quantity are two distinct physical questions and the state of knowledge on each has progressed independently. In the current project proposal, we utilize a timing forecast for reasons explained in the paragraphs below. Before discussing the exact details of that forecast, we provide some general background on the state of monsoon seasonal forecasts that are currently available.

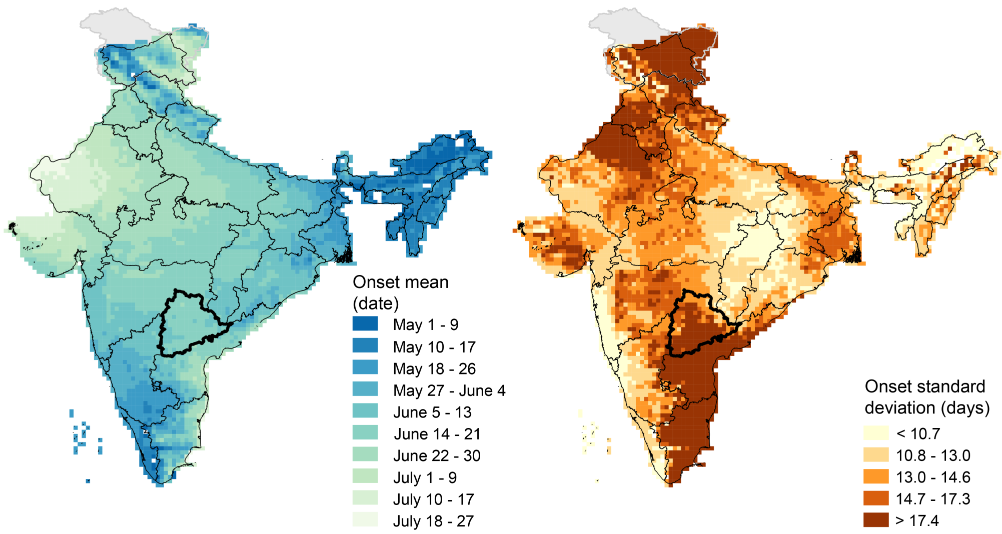
First, we note that there are a range of timescales over which forecasts can be made. In this project, we will focus on longer-term, or seasonal, forecasts, as these are important for large, *pre-season* input decisions. Short-term forecasting, or weather forecasts, typically range from next day to 14-day forecasts of exact weather conditions on a particular day. The accuracy of these forecasts diminishes with time, and the 14-day barrier is a physical limit on how far in advance exact conditions can be predicted. We assume farmers have access to these forecasts, as provided by the Indian Meteorological Department (IMD). Forecasts that attempt to provide information beyond this time horizon present information only about average conditions over a longer period of time than an individual day. Medium-range forecasts extend from 15 to under 30 days, and longer-range or seasonal forecasts attempt to provide information anywhere from 4 weeks to months in advance. The periods about which a forecast are made also tend to be longer, with some typical forecasts projecting changes over an entire month or season (e.g., a "rainier than average month").

Seasonal quantity forecasts have typically been one of the main areas of focus of the IMD which provides forecasts of the expected seasonal total rainfall each year at the beginning of the ISM. These forecasts, many statistical in nature, have traditionally focused on the All-India Rainfall Index (AIRI) (Rajeevan et al. (2007)). One of the most persistent criticisms of the AIRI forecasts is that the AIRI is itself a meaningless spatial average describing a phenomenon that has little spatial coherence (Moron et al. (2017)) and has little relevance to district- or state-level rainfall amounts. In simpler terms, an IMD forecast of "normal" monsoon rainfall amounts indicates nothing about rainfall amounts for a specific farmer in a specific location, rendering it useful for climate science but less useful for development or agricultural policy. More recently the IMD has provided quantity forecasts of particular regions, however, the accuracy is notably of limited use for individual household level decision. IMD's statistical quantity forecasts for large regional areas of India were found to have a low correlation with actual realized rainfall; Rosenzweig and Udry (2019) noted a low (∼0.2) or negative correlation in most of their sample locations. One surprising fact noted by Rosenzweig and Udry (2019) is that despite this low forecast accuracy, it does apparently lead to some changes of behavior among institutional investors. IMD and other agencies have also begun some experiments with dynamical (i.e., physics-based) models of the monsoon, but such forecasts similarly aim to forecast AIRI, rendering them uninformative for local decisions, though they do show some skill nationally (Das et al. (2015)).

Seasonal timing forecasts typically deal with the "onset" of the monsoon. While the monsoon arrives in early–mid June on average, uncertainty over monsoon onset is high: between 1979 and 2019, the standard deviation of the onset date was approximately 20 days. Appendix Figure F.1 plots information about the monsoon onset over India, with Telangana outlined in black. IMD forecasts the onset only over one part of the country— 'monsoon onset over Kerala" (MOK)— which is not relevant for most of the country, and forecasts with only two weeks of advance notice. There is no local IMD monsoon onset forecast, and MOK has been the subject of much of the research on onset timing and forecasting (e.g., Preenu et al., 2017). Crucially, for the current study, the monsoon does not progress smoothly northwards - it frequently halts, and local false starts are common, implying that MOK carries no signal for a farmer in parts of India outside of a narrow strip of coastal Kerala. Moron and Robertson (2014) define local agronomic onset and demonstrate the correlation between MOK and local onset over India. In Appendix Figure F.2, they show that there is virtually no signal value of MOK[61] in any region in India other than Kerala.

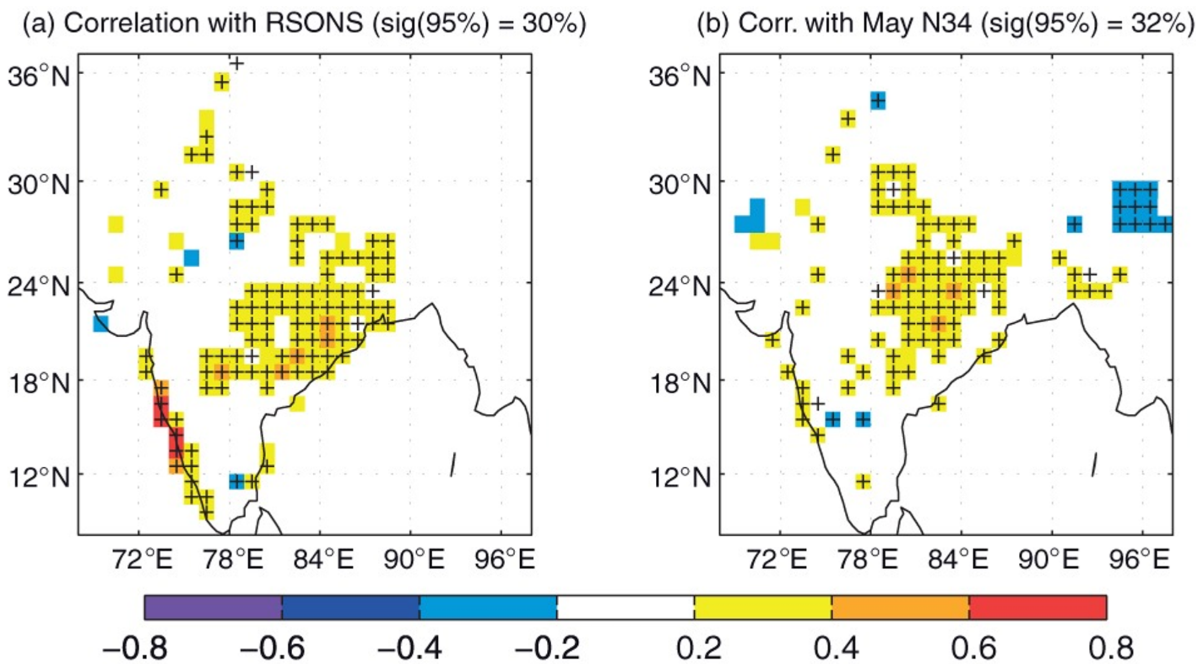
[61] In the paper, the authors define regional-scale monsoon onset (RSONS) as a summary measure of a number of onset indices over Kerala, which has a correlation of 0.92 with MOK (Moron and Robertson, 2014).

Figure F.1: Monsoon onset over India



Notes: The left panel shows the average monsoon onset day (in day-of-year) for the period 1979-2019 across India. The right panel shows the standard deviation of onset for the period 1979-2019. Local onset timing is derived following Moron and Robertson (2014), and captures the timing of the first wet spell of the season that is sufficient to wet the topsoil enough to plant crops and is not immediately followed by a dry spell (in which case it is known as a "false start"). In both panels, grid cells are 0.25 degrees. Telangana, the location of our experiment, is highlighted with a thick black border.

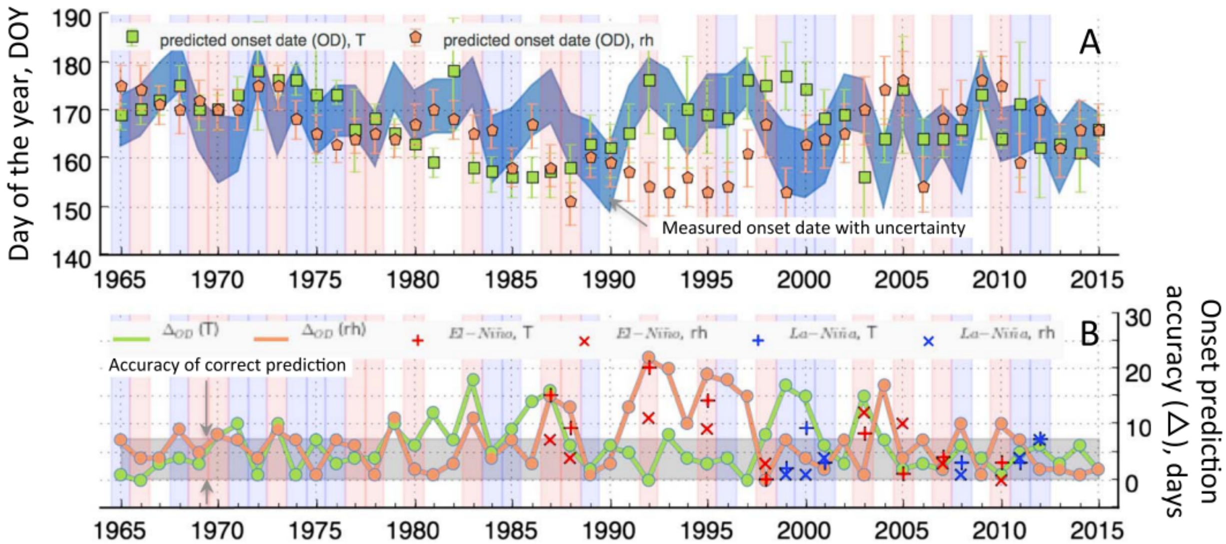
Figure F.2: Monsoon onset over Kerala has limited predictive power elsewhere in India



Notes: (a) Correlations between local-scale onset and the index of regional-scale onset (RSONS) defined in the text. (b) Correlations between local-scale onset and the Niño 3.4 SST index (N34) in May. Crosses indicate statistically significant correlations at the two-sided 95% level (see text). The value in parenthesis gives the fraction of significant grid boxes at the two-sided 95% level of significance according to a random-phase test. *Reproduced from* Moron and Robertson (2014).

In the present study, we focus on onset forecasts for two reasons. First, there is clear demand for information on timing: Mobarak and Rosenzweig (2014) demonstrate that onset timing is a key risk in farmers' decisions, with 40% of farmers opting to insure against the risk of a *delayed monsoon onset* when randomly offered such a product. Second, there has been a clearly dominant innovation in local onset forecasting, while there is no quantity forecast at local scales that is less uninformative than is currently available. A new model developed by the Potsdam Institute for Climate Impact Research (PIK) (Stolbova et al., 2016) uses observations of climate variables in the months leading up to the beginning of the monsoon to predict the timing of the onset of the monsoon up to one month in advance for a specific region of India and identifies a method for expanding this to other local regions. This forecast substantially outperforms the IMD forecasts that were analysed in Mobarak and Rosenzweig (2014), but is not yet widely available to farmers who might benefit from the information. The output from the PIK model is a probability distribution of potential onset dates of the monsoon for a range of states over the Eastern Ghats with particular accuracy over Telangana. When evaluated for onset dates from 1965-2015, this new scheme was "correct", defined

Figure F.3: The PIK forecast is accurate



Notes: Monsoon OD and prediction based on temperature (green) and relative humidity (orange) and measured (dark blue) (a) Onset date (OD) validated against NCEP/NCAR data. Red and light blue shading indicates positive ENSO (El Niño) and negative ENSO (La Niña) years. (b) Also shown is the difference between the real onset and predicted dates in days. Grey shading indicates range of 7 days, within the prediction is considered accurate (absolute value of the difference between the real onset date in a given year and the predicted onset date). *Reproduced from panels A and B of* Stolbova et al. (2016).

as local onset falling within ±7 days of the predicted date, 73% of years in the sample.[62] Moreover, while MOK date is forecast only two weeks in advance of the average MOK date, the PIK forecast is issued 35 days in advance of the average onset date in Telangana.

[62]Stolbova et al. (2016) also predicts withdrawal dates with 8 weeks lead-time and shows 84% of years falling within ±10 days of the actual withdrawal date.

G Becker et al. (1964) appendix

To elicit WTP for the given product, we use a Becker et al. (1964) (BDM) mechanism. We explain a two-step procedure to the household. In the first step, the household states their WTP. Then, the enumerator reveals an INR value written on the tablet. If the value listed on the tablet is above the household's stated WTP, the household does not get to purchase the product and their cash is returned. If the value is below the household's WTP, the household purchases the product and the cash goes to the enumerator. Because it is vital that this procedure is thoroughly understood by households before they begin, the enumerator plays a "practice" round with a common household product (e.g., a bar of soap). Therefore, any misunderstanding about the process will be resolved before the BDM procedure for the product of interest (i.e., the forecast or insurance) is started.

G.1 Methodological overview

The BDM mechanism is an incentive compatible process through which a rational participant should reveal their true maximum WTP. We implement the BDM procedure using the following steps, modeled closely after Berkouwer and Dean (2022):

1. Prior to the baseline visit, we assign each participant a random BDM price drawn from either the forecast or insurance distribution of BDM prices (described below).

2. Each enumerator is then given a sealed envelope that contains that BDM price (in INR) for the participants they are visiting that day. The enumerators are not aware of the assigned prices.

3. When the BDM procedure begins, the enumerator places the sealed envelope so that participant can see it.

4. Beginning with a starting price of INR 500 for both the forecast and insurance, the enumerator asks if the participant would commit to purchasing the respective product at that price. If the participant agrees, the enumerator subsequently increases the price by INR 500 and asks again if the participant would be willing to purchase the product at this new price. If the participant again agrees to purchase the product, the price is again raised by INR 500. If the participant declines this new price, the enumerator reduces the prices by INR 250.

   Instead, if the participant declines to buy the product at the initial price, the enumerator lowers the price by half (to 250) and asks again if the participant would be willing to purchase at this new, lower price. This process in repeated 11 times with the relevant intervals shrinking each iteration (or until the relevant interval drops below 1 rupee), so that by the end of the process we approach the participant's true WTP.

For concreteness, we illustrate the beginning iterations of this process:

(a) If the envelope said the price was INR 500, would you choose to purchase the forecast / insurance?

  i. If yes: If the envelope said the price was INR 1,000, would you choose to purchase the forecast / insurance?

    A. If yes: If the envelope said the price was INR 1,500, would you choose to purchase the forecast / insurance?

      - Etc.

    B. If no: If the envelope said the price was INR 1,250 would you choose to purchase the forecast / insurance?

      - Etc.

  ii. If no: If the envelope said the price was INR 250, would you choose to purchase the forecast / insurance?

    A. If yes: If the envelope said the price was INR 375, would you choose to purchase the forecast / insurance?

      - Etc.

    B. If no: If the envelope said the price was INR 125, would you choose to purchase the forecast / insurance?

      - Etc.

At the end of this process, the enumerator confirms that the participant fully understands their decision and the consequences of once the envelope is opened. They then ask that the participant retrieves the agreed upon amount in cash and place the bank notes next to the envelope containing the price. Finally, they will allow the participant a final chance to change their mind before the envelope is opened.

5. Once the participant has confirmed the price and has placed the cash, the participant and the enumerator together open the envelope and reveal the price.

6. If the participant's maximum WTP is lower than the BDM price in the envelope, the participant will not be able to purchase the forecast / insurance and will instead take back their cash.

7. If the participant's maximum WTP is at least as high as the BDM price in the envelope, the participant purchases the forecast / insurance, paying the price that was written inside the envelope out of their cash.

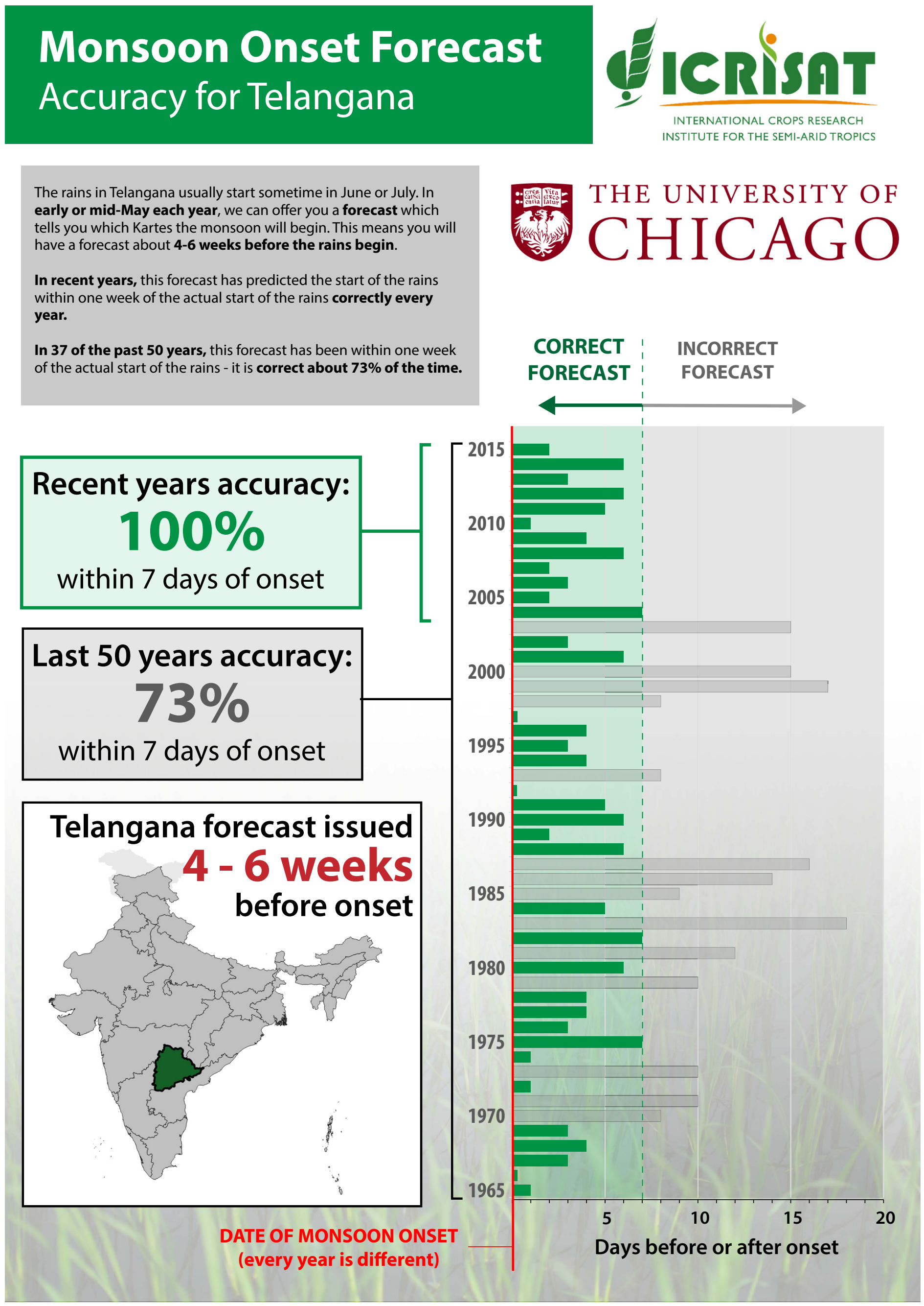
G.2 Distribution of BDM prices

We set the distribution of BDM price draws to low values so that nearly all farmers with positive willingness to pay will ultimately purchase the forecast or insurance product. In this way, we will increase power by maximizing adoption of each product without compromising the incentive compatibility of the BDM procedure. To this end, neither the participants nor the enumerators will be informed about the underlying price distribution. We choose the following distributions for each product:

- For the forecast product, 95% of participants will receive a price of zero while the remaining 5% of prices will be drawn from a uniform distribution ranging from 1 to 100 INR.
- For the insurance product, 95% of participants will receive a price of zero while the remaining 5% of prices will be drawn from a uniform distribution ranging from 1 to 100 INR.

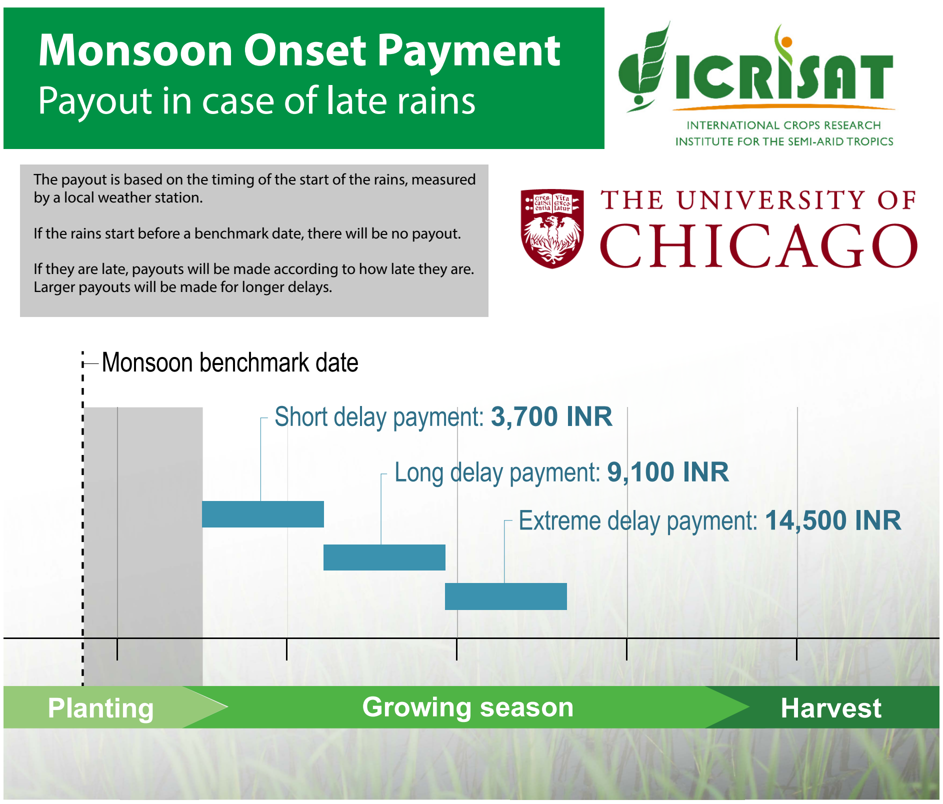
H Information sheets

Figure H.1: Forecast information sheet



Notes: We provided farmers with this information sheet about the forecast when offering them the product through the BDM mechanism described in Section 4 and Appendix G.

Figure H.2: Insurance information sheet



Notes: We provided farmers with this information sheet about the insurance product when offering them the product through the BDM mechanism described in Section 4 and Appendix G.