Online Appendix for Private Input Suppliers as Information Agents for Technology Adoption in Agriculture

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Table A1: Distance to the nearest interventions by treatment status

	(1) Govt. Extension	(2) Treated Dealers
Treatment	6.5386***	-7.3254***
	(0.9246)	(1.6138)
District FE	Yes	Yes
Mean in Control	4.922	11.688
Number of Observations	5536	5536
R squared	0.426	0.278

The dependent variables are distances (measured in km) between the farmer's house and the nearest activities supported by the research. Column 1 uses the distance between the farmer's home and the nearest Swarna-Sub1 cultivation through the government extension in the control blocks (any of the seeds distributed through the BAO or the farmer field day). Column 2 uses the distance between the farmer's home and the nearest dealer that was provided seeds. The coefficients in the table verify that farmers in treated blocks were further from the government extension activities and closer to dealers that were provided seeds. For instance, the coefficient in column 2 indicates that farmers in treated blocks were 7.32 km closer to the nearest dealer receiving seeds. Farmers in control blocks were 11.7 km from the nearest treated dealer (the control mean). This falls by 7.32 km in the treated blocks. The standard errors in both columns are clustered at the block level. Asterisks indicate that coefficient is statistically significant at the 1% ***, 5% **, and 10% * levels.

Table A2: Relationship between treatment assignment, non-response, and growing rice among the sample of farmers

	(1) Not Surveyed	(2) Grows Rice
Treatment	-0.010	0.024
	(0.013)	(0.015)
Dependent Variable Control Mean	0.079	0.920
R-Squared	0.043	0.011
District Fixed Effects	X	X
Observations	7200	6653

The table shows the difference in the rate of non-response and currently growing rice across treatment and control groups. All regressions use the data from the follow-up survey with farmers in August/September 2017. The dependent variables are indicator variables for not being surveyed (column 1) and an indicator for growing rice during the 2017 season (column 2). The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A3: Relationship between treatment assignment, non-response, and selling seeds among the sample of dealers

	(1) Located	(2) In Business
Dealer-Based Extension	0.035	-0.041
	(0.046)	(0.055)
Dependent Variable Control Mean	0.745	0.610
R-Squared	0.316	0.050
District Fixed Effects	X	X
Observations	613	473

The table shows the difference in the rate that dealers were not surveyed (column 1) and the difference in being in the rice seed business (column 2) across treatment and control groups. All regressions use the data from the follow-up survey with dealers around September 2017. The dependent variables are indicator variables for not being surveyed (column 1) and an indicator for currently selling rice seeds among those surveyed (column 2). The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A4: Correlation between flood exposure and socioeconomic characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
Area Cultivated (Acres)	-1.104	-0.593**				
	(0.666)	(0.242)				
Below Poverty Line Card			3.269	1.987		
			(2.016)	(1.451)		
Scheduled Tribe or Caste					4.183*	5.136**
					(2.113)	(2.366)
Dependent Variable Control Mean	16.075	16.075	17.374	17.374	17.353	17.353
R-Squared	.004	.129	.002	.142	.001	.144
District Fixed Effects		X		X		X
Observations	5134	5134	5521	5521	5529	5529

The table shows the relationship between flood exposure and household characteristics from the 2017 survey. The dependent variable in all regressions is the total number of days of flood exposure during the growing seasons from 2011-2017, measured by matching satellite data to the GPS coordinates of the household. All standard errors are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A5: Tobit estimates of extensive and intensive margins of adoption

	(1) Adoption	(2) Acres for Adopters
Treatment	0.034*	0.117*
	(0.019)	(0.061)
Dependent Variable Control Mean	0.063	1.470
District Fixed Effects	X	X
Observations	6653	6653

The table shows marginal effects from Tobit regressions of area cultivated with Swarna-Sub1 on strata fixed effects and treatment. All regressions use the data from the follow-up survey with farmers in August/September of 2017. Both columns show average marginal effects and delta-method standard errors. Column 1 shows the marginal effect on the probability of adoption, while column 2 shows the marginal effect on acreage cultivated, conditional on adoption. The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A6: Effects on learning-related outcomes

	(1) Extension Contact	(2) Saw Demonstration	(3) Learned during last 24 months
Treatment	0.013	0.003	0.018
	(0.010)	(0.012)	(0.017)
Dependent Variable Control Mean	0.057	0.043	0.090
R-Squared	0.016	0.031	0.191
District Fixed Effects	X	X	X
Observations	6120	6653	6653

The table shows treatment effects on contact with extension workers and learning about Swarna-Sub1. All regressions use the data from the follow-up survey with farmers in August/September of 2017. The dependent variables are an indicator for whether the farmer had any contact with the Village Agricultural Worker during the last year (column 1), whether the farmer had seen a demonstration of a new seed variety (column 2), and whether the farmer had learned about Swarna-Sub1 in the last 24 months (column 3). The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A7: Effects on adoption of different rice varieties

	Control Mean	Estimate
Pooja	0.376	0.011
		(0.048)
CR 1018	0.053	0.010
		(0.021)
MTU 1001	0.053	0.010
		(0.026)
Swarna	0.433	-0.041
		(0.049)
Sarala	0.099	-0.047
		(0.030)
Hybrid Rice	0.052	0.004
		(0.014)
Other Modern Seeds	0.065	0.024
		(0.026)
Local Varieties	0.304	0.052
		(0.040)

The table shows separate regressions for adoption of the rice varieties in each row on the treatment and district fixed effects. All regressions use the data from the follow-up survey with farmers in August/September of 2017. The first column shows mean adoption in the control group while the second column shows the coefficient estimate and its standard error (in parentheses). The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A8: Comparing Treatment Effects with an SMS messaging intervention

	(1) Adoption	(2) Acres	(3) Adoption	(4) Acres
SMS	-0.007	-0.012	-0.007	0.012
	(0.016)	(0.028)	(0.019)	(0.031)
Treatment			0.035	0.089*
			(0.026)	(0.046)
Treatment * SMS			-0.000	-0.049
			(0.032)	(0.055)
Dependent Variable Control Mean	0.063	0.093	0.063	0.093
R-Squared	0.024	0.023	0.028	0.027
District Fixed Effects	X	X	X	X
Observations	6653	6653	6653	6653

The table shows the treatment effects of the dealer-based extension, SMS message, and their combined effect. All regressions use the data from the follow-up survey with farmers in August/September of 2017. The dependent variables are whether the farmer was currently using Swarna-Sub1 (columns 1 and 3), and the acreage cultivated with Swarna-Sub1 (columns 2 and 4). The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A9: Average risk level of adopters by treatment group

	(1) Above-Median Risk	(2) Days Flood
Treatment	0.259*	6.742
	(0.144)	(4.322)
Mean in Control	0.239	6.273
Number of Observations	441	441
R squared	0.068	0.046

The regressions show average exposure to flood risk between Swarna-Sub1 adopters in treatment and control blocks. The dependent variable in column 1 is the binary indicator for above-median risk (exposure to flooding for four or more days). The dependent variable in column 2 is the days of exposure across all monsoon seasons (June-October) from 2011 to 2017. Standard errors are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A10: Heterogeneous Treatment Effects on Adoption

	(1)	(2)	(3)	(4)	(5)
Treatment	0.032	0.027	0.033*	0.023	0.013
	(0.020)	(0.018)	(0.019)	(0.018)	(0.017)
Scheduled Tribe	0.023*		0.018		0.018
or Caste	(0.012)		(0.016)		(0.016)
Below Poverty	0.030***			0.013	0.019
Line Card	(0.011)			(0.012)	(0.013)
Area Cultivated	0.015***	0.013***			0.013***
(Acres)	(0.003)	(0.004)			(0.003)
Treatment * Area		0.002			0.003
Cultivated		(0.006)			(0.006)
Treatment *			0.013		0.011
Scheduled Tribe or Caste			(0.025)		(0.026)
Treatment *				0.023	0.021
Below Poverty Line Card				(0.019)	(0.021)
Dependent Variable Control Mean	0.069	0.069	0.063	0.063	0.069
R-Squared	0.046	0.042	0.029	0.031	0.047
District Fixed Effects	X	X	X	X	X
Observations	6177	6193	6642	6628	6177

The table shows heterogeneous effects of the dealer treatment by farm size, caste, and poverty status (columns 2-5). Column 1 shows the correlations between these characteristics and adoption, across both treatment and control blocks. All regressions use the data from the follow-up survey with farmers in August/September of 2017. The dependent variable in all regressions is whether the farmer was currently using Swarna-Sub1. The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A11: Share of dealers in estimation sample that received seeds and information

	(1) All	(2) In Business
Dealer-Based Extension	0.423***	0.404***
	(0.052)	(0.057)
Dependent Variable Control Mean	0.000	0.000
R-Squared	0.329	0.324
District Fixed Effects	X	X
Observations	473	274

The table shows the "first-stage impact" of a dealer being located in a treatment block on the probability that they were provided Swarna-Sub1 seeds and information. Column 1 is for all dealers that were reached during the year 2 survey, while column 2 is only for the dealers that were still selling rice seeds. The dependent variable in both regressions is an indicator for whether the dealer received seeds and information. The standard errors are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Table A12: Dealer-level correlation between receiving intervention and selling Swarna-Sub1

	(1) Year 2	(2) Year 3	(3) Year 5
Dealer Received Intervention	0.194*	0.052	0.167
	(0.106)	(0.074)	(0.102)
Mean Outcome No Intervention	0.385	0.250	0.349
R-Squared	0.098	0.121	0.257
District Fixed Effects	X	X	X
Observations	133	135	113

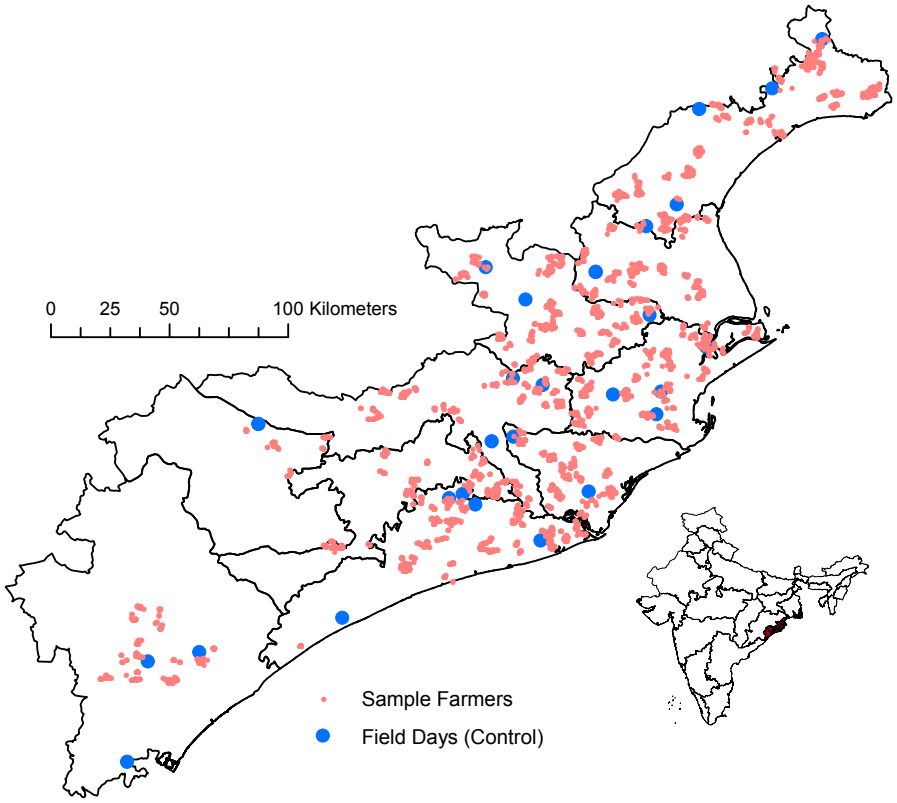
The table shows the correlation between being provided Swarna-Sub1 seeds and information (receiving the intervention in treatment blocks) and selling Swarna-Sub1 seeds during the following four years. The data in all columns are limited to treatment blocks. The dependent variable in all regressions is an indicator for the dealer selling the seeds that season. Column 1 is for year 2 (2017), while columns 2 and 3 are for years 3 (2018) and 5 (2020), respectively. The standard errors are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels. See Table 5 in the main text for the results using the random block-level variation in treatment.

Table A13: Correlation between farmer-level adoption of Swarna-Sub1 in 2017 and local seed production

	(1)	(2)
2014-2016 Seed Production	0.007***	0.010***
	(0.002)	(0.003)
Dependent Variable Mean	0.081	0.081
R-Squared	0.030	0.059
District Fixed Effects	X	X
Control Variables		X
Observations	6653	6599

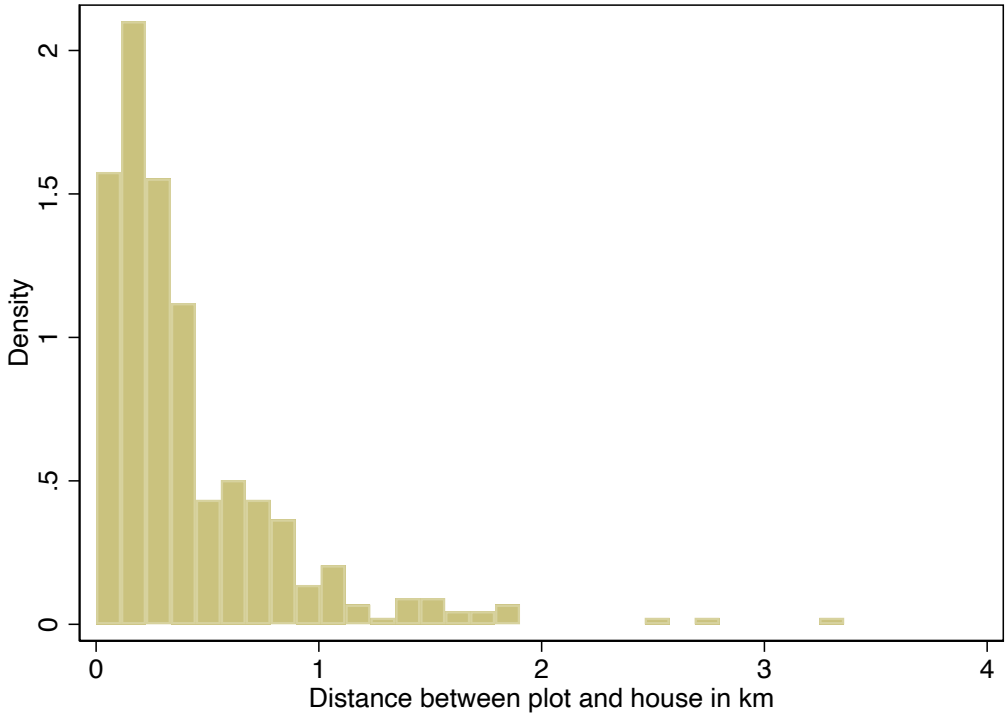
The table shows the within-district correlation between Swarna-Sub1 seed adoption by farmers and the amount of seed produced locally by growers. The estimates come from the 2017 survey with farmers where Swarna-Sub1 adoption is regressed on the average annual Swarna-Sub1 seed production in the block from 2014-2016. Seed production is measured in hundreds of quintals (1 quintal=100 kg). The dependent variable in both regressions is an indicator variable for adopting Swarna-Sub1. The control variables in column 2 are all of the covariates in Table 1 of the main text. The standard errors in each regression are clustered at the block level. Asterisks indicate statistical significance at the 1% ***, 5% **, and 10% * levels.

Figure A1: Location of the sample



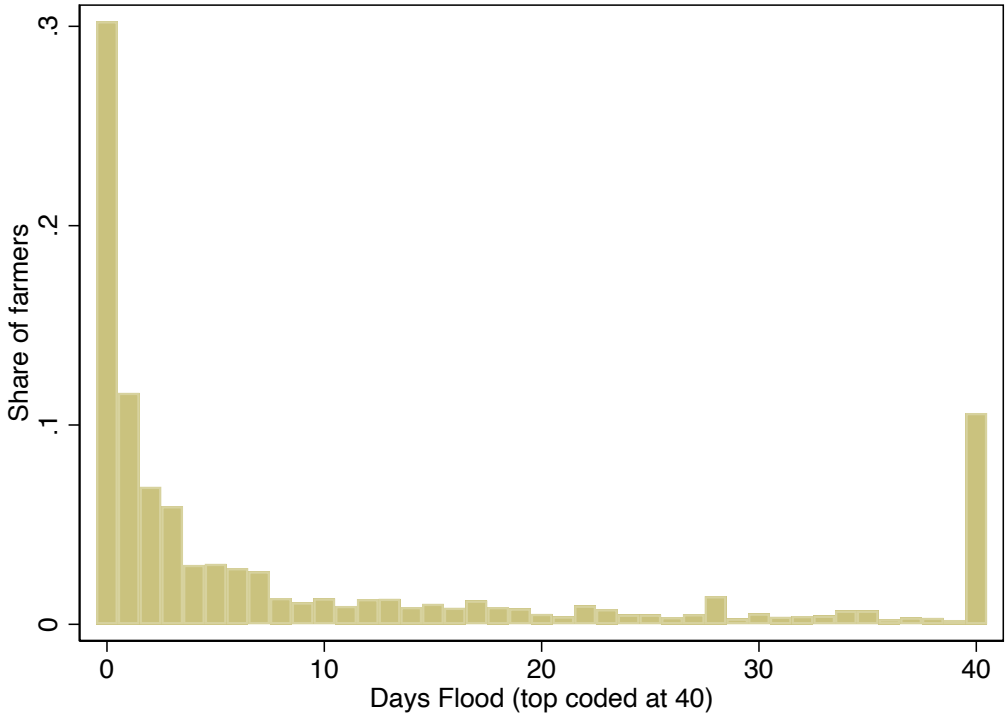
Notes: The figure shows the location for 5,536 of the 7,200 same farmers where we obtained GPS coordinates (light red dots) and the location of the farmer field days in the control blocks (blue dots). The map of India in the lower right shows the location of the sample area in the coastal belt of Odisha state. The district boundaries were obtained from the GADM database of Global Administrative Areas (Global Administrative Areas, 2018).

Figure A2: Distance between plots and houses



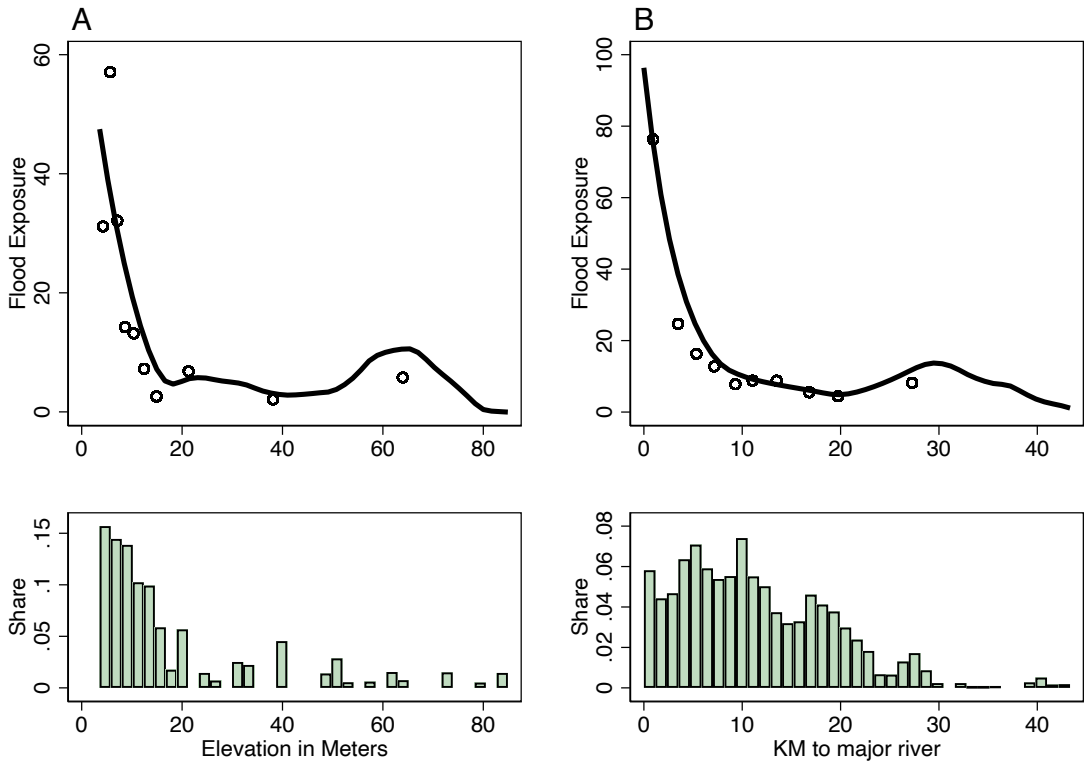
Notes: Figure shows the distribution of distances between houses and the rice plots (in km) for farmers in Emerick and Dar (2021). The district in this study is one of the 10 districts in the current paper. 92 percent of fields are within 1 km of the house.

Figure A3: Distribution of measure of flood exposure



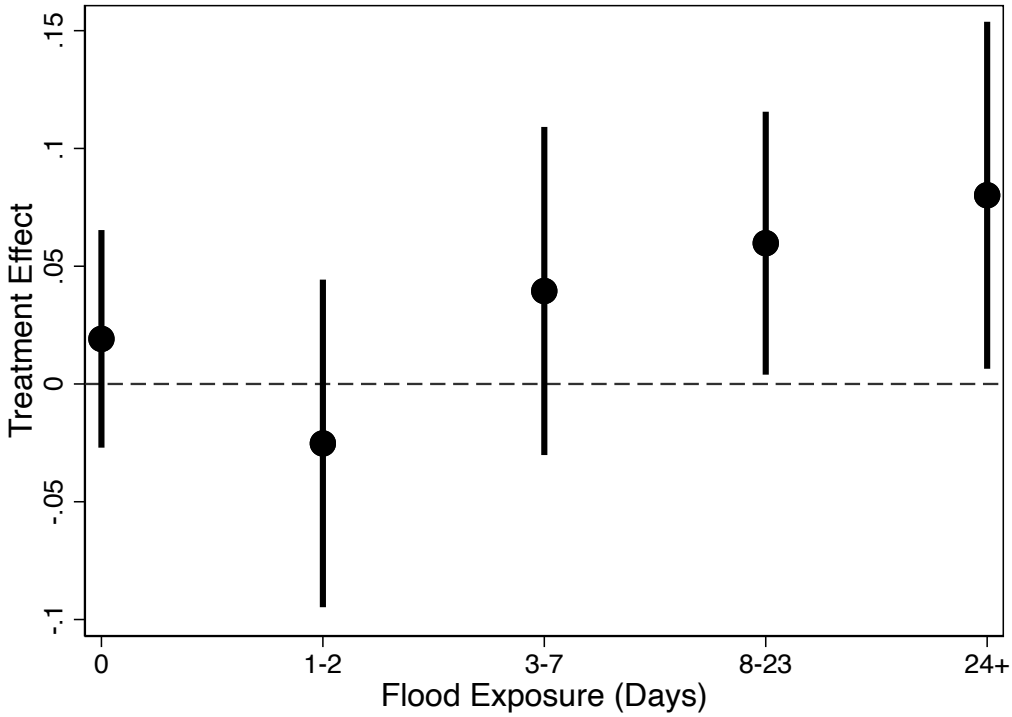
Notes: Figure shows the distribution of the days flooded from 2011 to 2017 for 5,536 households. The height of each bar displays the share of farmers with the corresponding number of days of exposure. All farmers with more than 40 days of exposure are included in the last bin at 40 days.

Figure A4: Correlation between 2011-2017 flood exposure, elevation, and proximity to rivers



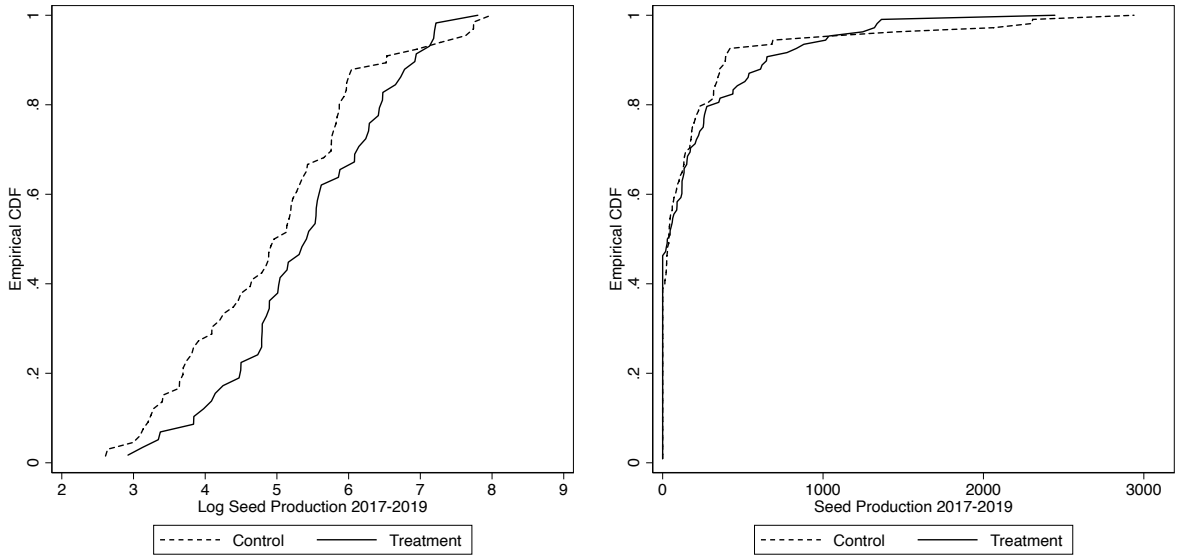
Notes: Panel A shows a non-parametric fan regression of flood exposure on elevation (heavy black line) and the average exposure levels for 10 equal-sized bins of elevation. The distribution of elevation is displayed at the bottom of the panel. Panel B shows a similar figure where flood exposure is regressed on proximity to major rivers.

Figure A5: Treatment effects by flood exposure with imputing locations for households with missing GPS coordinates



Notes: The figure shows treatment effects from a single regression of adoption on separate treatment indicators for different levels of flood exposure and district fixed effects. It is identical to Figure 2 in the main text with the one exception being that household locations are imputed from village locations for 926 observations with missing GPS coordinates. The 5 bins of flood exposure correspond to households with no exposure from 2011-2017 and then an approximately equal division of households with at least one day of exposure. The dots are the treatment effects of dealer-based extension and the vertical lines denote 95 percent confidence intervals.

Figure A6: Cumulative Distribution Functions of seed production by treatment, 2017-2019



Notes: The figure shows the cumulative distribution functions of block-year level seed production for the years 2017, 2018, and 2019. The left panel uses the log of seed production while the right panel uses the level (measured in quintals where 1 quintal = 100kg).