Demand and supply factors constraining the emergence and sustainability of an efficient seed system: A mock report

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October 25, 2022

Abstract

Agricultural technology remains under-adopted among smallholder farmers in Sub-Saharan Africa. We investigate how the quality of an agricultural technology—improved maize seed—affects its adoption. We test three hypotheses that will be tested in a series of randomized controlled trials among agro-input dealers and smallholder farmers in Uganda. This document is essentially a (somewhat bare bone) mock report, where the entire analysis has been run on simulated data before the start of (midline) data collection. Mock reports serve to tie the hands of the researcher, reducing degrees of freedom in the choice of what specifications to run and what variables to include when testing hypotheses. **humphreys2013fishing** argue that (comprehensive but nonbinding) mock reports such as this one can reduce intentionally or unintentionally fishing, thereby making science more reliable body of published research.

keywords: seed systems, information clearinghouse, learning failures, information, input quality, agricultural technology adoption

JEL codes: O13; Q12; Q16; D82; D83

The study

The study for which this document provides a mock report was designed to addresses quality considerations about the technology (improved seed) as a particular constraint to adoption, a topic that has received considerable attention

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recently (**MICHELSON2021102579**; **bold2017lemon**). In the study, we specifically explore (perceived) quality of improved maize seed as a constraint to its adoption among a sample of smallholder maize farmers in Uganda. Maize is an important crop in Uganda, both for home consumption and as a source of income. Yet, the uptake of improved maize seed by smallholder farmers to improve its yields remains persistently low, despite their higher yield potential compared to traditional seed varieties. Studies have advanced several factors explaining smallholder's limited adoption of improved inputs in Uganda, and of improved maize seed in particular. These have included farmers' beliefs that the inputs are of poor quality—counterfeited, adulterated, or otherwise non-performant (**bold2017lemon**; **doi:10.1080/00220388.2018.1464143**; **BARRIGA2020104928**). Our study will test interventions aimed at identifying the relative importance of potential sources of these (perceived) quality issues at different levels for agricultural technology adoption. It will bring to light the cognitive, economic, and behavioral aspects that underlie under-adoption of these technologies.

In the study, we test three hypotheses through a series of randomized controlled trials among agro-input dealers and smallholder farmers in Uganda. In a first hypothesis, quality concerns that constrain uptake are caused by information inefficiencies at the level of the agro-input dealer, who is assumed to lack knowledge about proper storage and handling. An intensive training program is expected to increase improved maize seed quality and subsequent adoption by farmers. A second hypothesis conjectures that information asymmetry between seller and buyer with respect to the quality of seed – a classic lemons technology – leads to under-adoption. We implement a crowd-sourced information clearinghouse similar to yelp.com to test this hypothesis. This hypothesis targets the interaction between farmers and input dealers. A third hypothesis targets farmers directly, as sub-optimal adoption is assumed to be caused by learning failures: Farmers might attribute disappointing outcomes to poor input quality, while in reality many input dimensions like the time of planting, weeding and fertilizer application co-determine outcomes. An ICT-mediated information campaign that stresses the importance of paying attention to all input dimensions is implemented to test this hypothesis. For detailed information about the study, we refer to the associated pre-analysis plan of the study that can be found on the AEA RCT registry (https://www.socialscienceregistry.org/trials/6361).

Baseline data was collected among a sample of about 350 agro-input dealers towards the end of 2020 and among a sample of about 3,500 smallholder farmers in the beginning of 2021. This mock report relies extensively on this baseline data. A first part of the report provides descriptive statistics for the baseline data. Tables 1 to 3 report baseline summary statistics at the agro-input dealer level. Tables 4 to 7 does this for the farmers.

A second part checks for balance between treatment and control groups in a set of pre-registered baseline characteristics—typically the first table in RCT studies. Table 8 does this for agro-input dealers, while Table 9 looks at balance between treatment and control farmer. As we test 3 different hypotheses using three different interventions, we also need 3 balance tests for each variable. We also have a short section on attrition.

We then turn to the analysis of the (pre-registered) outcomes that will be used to judge the effectiveness of the interventions—the center piece of a mock report. In particular, we simulate mock endline data by randomly sampling from the baseline outcome and adding a hypothesized treatment effect. We then report difference between treatment and control groups using ANCOVA models that also control for the baseline value of the outcome. Results of these regressions are reported for a set of primary outcomes at the agro-input dealer level (Table 12) as well as at the farmer level (Table 25). We also provide various tables of secondary outcomes that are grouped by family, again for agro-input dealers (Tables 14 to 24) and for farmers (Tables 27 to 34).

This document was written using the open source lyx/Latex typesetting software. The analysis is contained in an R script called "mock_report.R", which is run from within lyx/latex using the knitr engine. All code, data and documents are also under revision control using git and publicly accessible via github (https://github.com/bjvca/Seed_systems_project). The fact that the entire project is under revision control using git/github provides detailed and time-stamped recording of any changes made over the course of the project, further reducing scope for fishing by the researchers and increasing transparency with respect to the decisions made.

Descriptive statistics

The first part of this report provides descriptive statistics for the baseline data. Tables 1 to 3 report baseline summary statistics at the agro-input dealer level. Tables 4 to 7 does this for the farmers.

Orthogonality tests of randomization balance

Testing if treatment and control groups are comparable in terms of a set of pre-registered baseline characteristics are often reported in field experiments. Table 8 does this for agro-input dealers, while Table 9 looks at balance between treatment and control farmer. As we test 3 different hypotheses using three different interventions, we also need 3 balance tests for each variable.

Orthogonality tests of survey attrition

While random attrition only reduces statistical power, attrition which is correlated with one of our treatments could bias estimates. We focus on limiting attrition during data collection because it is difficult to solve ex post. That is why we recorded the respondents' full names, primary and secondary telephone numbers, and enumerators captured the locations ie. the GPS coordinates of the interviews. We collected this information for every participant during baseline data collection. We additionally asked the agro-input dealers for other (nick)names that they are known by, enumerators took pictures of their shops

Table 1: Descriptive statistics - Agro-input dealer (baseline)

	mean	min	max	SD	nobs
Respondent's age in years	32.43	15	80	11.49	347
Respondent is male	0.595	0	1	0.492	348
Respondent finished primary education	0.920	0	1	0.271	339
Respondent finished secondary education	0.386	0	1	0.488	339
Respondent owns shop	0.555	0	1	0.498	348
Shop's distance to nearest tarmac road in km	6.556	0	52	10.39	343
Shop's distance to nearest murram road in km	0.190	0	9	0.626	348
Shop only sells farm inputs	0.741	0	1	0.439	348
Number of customers per day	41.49	2	300	46.49	346
Number of customers per day **buying maize seed**	21.27	0	250	26.80	347
Years since shop establishment	5.339	0	33	6.299	348
Shop also sells machinery	0.066	0	1	0.249	348
Shop also sells equipment	0.724	0	1	0.448	348
Shop also sells chemicals	0.945	0	1	0.228	348
Shop also sells fertilizers	0.960	0	1	0.197	348
Respondent received training on maize seed handling/storage	0.526	0	1	0.500	348
Respondent received this training **last year**	0.267	0	1	0.443	348
Respondent received this training last year **by ISSD**	0.106	0	1	0.308	341
Number of maize varieties in stock	2.917	0	10	1.755	348
Number of **hybrid** maize varieties in stock	1.681	0	8	1.330	348
Shop has Longe 10H in stock	0.684	0	1	0.466	348
Shop has Longe 7H in stock	0.161	0	1	0.368	348
Number of **OPV** maize varieties in stock	1.276	0	5	0.686	348
Shop has Longe 5 in stock	0.885	0	1	0.319	348
Shop has Longe 4 in stock	0.264	0	1	0.442	348
Shop stores seed away from other products	0.460	0	1	0.499	348
Shop has problem with pests	0.649	0	1	0.478	348
Shop has leak-proof roof	0.537	0	1	0.499	348
Shop has insulated roof	0.580	0	1	0.494	348
Shop has insulated walls	0.813	0	1	0.390	348
Shop is ventilated	0.793	0	1	0.406	348
Shop has plastered walls	0.920	0	1	0.272	348
Shop's floor is cement/tiles (not mud)	0.974	0	1	0.160	343
Shop's light is ambient (not direct sunlight/dark)	0.825	0	1	0.381	348
Shop stores seed on pallets/shelves (not directly on wood/floor/cardboard)	0.707	0	1	0.456	331
Shop stores maize seed in open containers	0.155	0	1	0.363	348
Shop displays official certificate	0.460	0	1	0.499	348
Shop's cleanness/professionality rating by enumerator	3.451	1	5	1.098	348

Table 2: Descriptive statistics - Agro-input dealer (baseline)

	mean	min	max	SD	nobs
Shop never had expired seed	0.589	0	1	0.493	348
Shop had expired seed but always handled it correctly	0.759	0	1	0.429	145
Shop always explains to customers how seed should be used	0.457	0	1	0.499	348
Shop always recommends complementary inputs to customers	0.529	0	1	0.500	348
Shop offers extension/training to some/ to everyone	0.483	0	1	0.500	348
Shop offers discounts for large quantities	0.750	0	1	0.434	348
Shop's smallest seed bag is 1 kg (not larger)	0.728	0	1	0.445	335
Shop repackages seed if customers want small quantities	0.523	0	1	0.500	348
Shop charges more if customers buy only 1 kg	0.154	0	1	0.362	182
Shop keeps expiry date when repackaging seed	0.588	0	1	0.494	182
Shop provides seed on credit to some	0.595	0	1	0.492	348
Number of customers who received credit (if shop provides credit)	11.02	1	120	13.80	193
Number of **women** who received credit (if shop provides credit)	3.430	0	35	4.692	200
Shop received seed related complaint from customer	0.644	0	1	0.480	348
Shop accepts mobile money as payment	0.348	0	1	0.477	348
Shop sometimes delivers to customers	0.399	0	1	0.490	348
Dealer's self-rating: location	3.876	1	5	0.878	348
Dealer's self-rating: price	3.922	1	5	0.867	348
Dealer's self-rating: product quality	4.046	1	5	0.844	348
Dealer's self-rating: stock, convenient quantities	3.583	1	5	1.002	348
Dealer's self-rating: reputation	4.319	2	5	0.735	348
Shop is registered with UNADA	0.442	0	1	0.497	319
Shop has trading license by local government	0.749	0	1	0.435	338
Shop is member of other professional association	0.345	0	1	0.476	325
Number of inspections by DAO/MAAIF/UNADA last year	1.866	0	43	3.843	335
Shop received warning after inspection	0.317	0	1	0.466	334
Shop's products were confiscated after inspection	0.145	0	1	0.353	337
Shop was closed after inspection	0.009	0	1	0.093	342
Shop has equipment to monitor seed moisture	0.026	0	1	0.159	348
Shop monitors temperature	0.026	0	1	0.159	348
Shop temperature where seed is stored in degrees Celsius	25.31	19.5	52	2.996	345
Moisture in random seed bag in percent	13.576	10.3	17.4	1.522	232
Random seed bag shows expiry date	0.181	0	1	0.386	232
Random seed bag shows expiry date but seed is expired	0.049	0	1	0.218	41
Random seed bag shows packaging date	0.677	0	1	0.469	232
Packaging date is visible but more than 6 months ago	0.039	0	1	0.194	154
Days since packaging date/expiry date minus 6 months	64.96	9	261	47.41	183
Random seed bag is original and undamaged	0.935	0	1	0.246	232
Random seed bag shows certification sticker	0.082	0	1	0.275	232
Random seed bag shows lot number	0.504	0	1	0.501	232
Random seed bag shows e-verification	0.026	0	1	0.159	232

Table 3: Descriptive statistics - Agro-input dealer (baseline)

	mean	min	max	SD	nobs
Shop is known by random farmer in village with most clients	0.557	0	1	0.260	347
Shop sold seed to this farmer	0.247	0	1	0.184	342
Years since shop has this farmer as customer (if shop sold seed)	3.729	0	13	2.310	313
Shop sold seed to someone this farmer knows	0.085	0	1	0.137	341
Shop's maize seed rating on quality by farmers (who (know someone who) bought seed there)	3.772	1.5	5	0.527	176
Shop's maize seed rating on yield by farmers	3.537	1.5	5	0.527	175
Shop's maize seed rating on drought tolerance by farmers	2.938	1	5	0.525	169
Shop's maize seed rating on pest/disease tolerance by farmers	2.445	1	4	0.516	173
Shop's maize seed rating on time of maturity by farmers	3.817	2	5	0.403	172
Shop's maize seed rating on germination by farmers	3.669	2	5	0.540	172
Number of shop's maize seed ratings by farmers	NA	NA	NA	NA	NA
Shop refunds if problem, according to farmers (who (know someone who) bought seed there)	0.331	0	1	0.302	316
Shop gives credit, i.e. inputs one can pay later, according to farmers	0.410	0	1	0.313	314
Shop advises during sales, according to farmers	0.757	0	1	0.263	320
Shop delivers seed to clients, according to farmers	0.235	0	1	0.282	315
Shop provides after-sales service, according to farmers	0.241	0	1	0.288	322
Shop accepts different payment methods, according to farmers	0.420	0	1	0.327	314
Shop sells small quantities if necessary, according to farmers	0.898	0	1	0.188	324

Table 4: Descriptive statistics - Farmer (baseline)

	mean	min	max	SD	nobs
Homestead's distance to nearest tarmac road in km	9.390	0	100	10.81	3302
Homestead's distance to village headquarters in km	0.745	0	15	0.903	3436
Homestead's distance to nearest agro-input shop in km	3.779	0	52	4.789	3339
Number of agro-input shops in farmer's village/neighborhood	2.163	0	25	2.346	3263
Homestead's distance to nearest neighbor in km	0.114	0	2	0.183	3463
Farmer's age in years	48.62	18	97	13.38	3453
Farmer is male	0.777	0	1	0.416	3470
Farmer is married	0.884	0	1	0.320	3470
Farmer had no formal education	0.079	0	1	0.270	3437
Farmer finished primary education	0.507	0	1	0.500	3437
Farmer finished secondary education	0.089	0	1	0.284	3437
Number of people in household (incl. respondent)	8.695	1	25	3.979	3470
Number of rooms in house	3.490	1	10	1.445	3469
Roof is made of iron sheets/tiles (not grass)	0.928	0	1	0.259	3460
Farmer's land for crop production in acres	3.348	0.185	100	4.320	3442
Years since farmer started growing maize	23.09	0	82	13.14	3470
Farmer is member of (maize) farmer group/association/cooperative	0.126	0	1	0.332	3459
Farmer used improved maize seed (OPV/hybrid) for any field last season	0.492	0	1	0.500	3466
Farmer used farmer saved maize seed (if he/she used improved seed)	0.163	0	1	0.370	1664
Farmer bought maize seed at agro-input shop (if he/she used improved seed)	0.668	0	1	0.471	1664
Farmer used maize seed for more than 3rd (not 1st/2nd) time (if he/she used farmer saved seed)	0.529	0	1	0.500	261
Amount of improved maize seed bought from agro-input shop in kg (if farmer bought from shop)	11.07	1	200	13.48	1108
Farmer did not buy seed at agro-input shop because it is too expensive	0.860	0	1	0.347	1813
Farmer did not buy seed at agro-input shop because it is of poor quality	0.088	0	1	0.283	1813
Farmer bought seed at particular agro-input shop because it is of very good quality	0.578	0	1	0.494	948
Farmer says seed at agro-input shop is of poor quality due to disappointing yield	0.252	0	1	0.435	151
Farmer says seed at agro-input shop is of poor quality due to disappointing pest tolerance	0.252	0	1	0.435	151
Farmer says seed at agro-input shop is of poor quality due to disappointing germination	0.318	0	1	0.467	151
Farmers thinks seed at agro-input shop is counterfeit/adulterated	0.685	0	1	0.465	2673
Farmer mentioned Longe 5/Nalongo when asked for improved maize varieties	0.655	0	1	0.475	3470
Farmer mentioned Longe 7R/Kayongo-go when asked for improved maize varieties	0.076	0	1	0.266	3470
Farmer mentioned Wema when asked for improved maize varieties	0.010	0	1	0.099	3470

Table 5: Descriptive statistics - Farmer (baseline)

	mean	min	max	SD	nobs
Farmer grew maize on only 1 field (stand alone/mixed)	0.653	0	1	0.476	3470
Number of fields farmer grew maize on (stand alone/mixed)	1.463	1	5	0.725	3470
Area of randomly selected maize field in acres	1.181	0.075	20	1.001	3465
This maize field was intercropped	0.702	0	1	0.457	3470
This maize field was intercropped with beans	0.419	0	1	0.493	3470
This maize field was intercropped with soybeans	0.108	0	1	0.311	3470
This maize field was intercropped with groundnuts	0.108	0	1	0.311	3470
This maize field was intercropped with cassava	0.267	0	1	0.443	3470
This maize field was intercropped with millet	0.002	0	1	0.045	3470
This maize field was intercropped with sorghum	0.004	0	1	0.061	3470
Percentage allocated to maize (if this field was intercropped)	56.43	5	99	17.84	2414
Farmer planted hybrid maize seed on this field	0.264	0	1	0.441	3124
Farmer planted open-pollinated maize seed on this field	0.260	0	1	0.439	3124
Farmer planted local land race maize seed on this field	0.448	0	1	0.497	3318
Farmer planted hybrid or open-pollinated maize seed on this field	0.552	0	1	0.497	3318
This maize seed was farmer saved	0.579	0	1	0.494	3429
Farmer bought this maize seed at agro-input shop	0.330	0	1	0.470	3429
This maize seed was hybrid but farmer saved	0.050	0	1	0.217	3103
This maize seed was open-pollinated, farmer saved but used 4 or more times	0.031	0	1	0.173	3108
Farmer's rating of this maize seed on general quality	3.385	1	5	1.032	3461
Farmer's rating of this maize seed on yield	3.040	1	5	1.081	3462
Farmer's rating of this maize seed on drought tolerance	2.806	1	5	1.004	3378
Farmer's rating of this maize seed on pest/disease tolerance	2.189	1	5	1.009	3456
Farmer's rating of this maize seed on early maturity	3.416	1	5	1.025	3457
Farmer's rating of this maize seed on demand/market/output price	2.209	1	5	1.096	3299
Farmer's rating of this maize seed on taste	4.031	1	5	0.929	3448
Farmer's rating of this maize seed on price	3.187	1	5	1.223	3163
Farmer's rating of this maize seed on availability	3.362	1	5	1.025	3387
Farmer's rating of this maize seed on germination	3.570	1	5	0.937	3468
Farmer was satisfied with this maize seed	0.678	0	1	0.467	3470
Farmer told supplier that he/she was not satisfied (if not satisfied with maize seed)	0.275	0	1	0.447	509
Farmer would use this maize seed again	0.764	0	1	0.425	3470
Amount of maize seed used on this field in kg	9.616	0.2	200	9.871	3413
Price of this maize seed per kg in UGX	4308	0	14500	3463	1683
Price of this maize seed per kg in dollars	1.210	0	4.071	0.972	1683
Cost of this maize seed in UGX (amount in kg x price per kg)	38612	0	1e+06	61988	1677
Cost of this maize seed in dollars (amount in kg x price per kg)	10.84	0	280.8	17.40	1677

Table 6: Descriptive statistics - Farmer (baseline)

	mean	min	max	SD	nobs
Farmer spaced seeds correctly on this maize field (2.5 feet x 1 foot)	0.109	0	1	0.312	3470
Number of seeds per hill on this maize field	3.350	1	8	1.254	3362
Farmer sowed correct number of seeds per hill on this maize field (1)	0.042	0	1	0.201	3362
Farmer applied organic manure on this maize field	0.074	0	1	0.262	3466
Farmer applied DAP/NPK on this maize field	0.249	0	1	0.432	3465
Amount of DAP in kg on this maize field (if farmer applied DAP/NPK)	16.88	0.1	150	20.68	845
Farmer applied Urea on this maize field	0.075	0	1	0.263	3466
Amount of Urea in kg on this maize field (if farmer applied Urea)	15.81	0.5	150	19.89	251
Number of times farmer weeded this maize field	2.560	0	5	0.650	3466
Farmer weeded this maize field 3 or more times	0.529	0	1	0.499	3466
Days after planting farmer first weeded this maize field	17.53	1	60	6.662	3428
Farmer weeded this maize field first at correct time (18-20 days after planting)	0.063	0	1	0.244	3428
Farmer used pesticides/herbicides/fungicides on this maize field	0.409	0	1	0.492	3463
Farmer planted at correct time on this maize field (1-3 days after 1st rains)	0.699	0	1	0.459	3441
Farmer re-sew where seeds did not germinate on this maize field	0.483	0	1	0.500	3464
Number of maize bags harvested from this field last season (incl. consumed)	5.364	0	250	8.520	3460
Kilograms per bag	100.5	40	149	8.978	3469
Yield in kg (number of harvested maize bags x kg per bag)	544.2	0	25000	858.2	3459
Land productivity in kg/acre (yield/area)	499.5	0	28000	771.2	3454
Market value per bag at harvest in UGX	70259	20000	149999	27821	3400
Market value per bag at harvest in dollars	19.73	5.616	42.12	7.812	3400
Yield in UGX (number of harvested maize bags x market value per bag)	391126	0	36250000	835450	3390
Yield in dollars (number of harvested maize bags x market value per bag)	109.8	0	10178	234.6	3390
Land productivity in UGX/acre (yield/area)	351874	0	1.8e+07	534819	3385
Land productivity in dollars/acre (yield/area)	98.80	0	5054	150.2	3385
Farmer sold maize from this field	0.513	0	1	0.500	3470
Number of maize bags sold from this field (if farmer sold maize)	5.007	0.02	250	9.134	1778
Price farmer charged per bag in UGX	53596	1	750000	38713	1774
Price farmer charged per bag in dollars	15.05	0	211	10.87	1774
Revenue in UGX (number of sold maize bags x price per bag)	313	0.001	70000	1734	1772
Revenue in dollars (number of sold maize bags x price per bag)	0.09	0	20	0.5	1772
Amount kept as seed in kg	17.57	0	400	33.37	1710
Number of maize bags farmer expects to harvest from this field next season (incl. consumed)	8.764	0	280	12.01	2574

Table 7: Descriptive statistics - Farmer (baseline)

	mean	min	max	SD	nobs
Farmer knows particular shop in neighborhood	0.556	0	1	0.380	3449
Farmer bought shop's seed (if he/she knows any shop)	0.258	0	1	0.346	2804
Years since farmer became shop's customer (if he/she bought seed from any shop)	4.104	0	35	3.873	1280
Farmer knows someone who bought shop's seed (if he/she did not buy seed from all shops but knows any)	0.079	0	1	0.235	2462
Farmer bought shop's seed last season	0.448	0	1	0.468	598
Farmer's rating of particular shop on general quality (if he/she (knows someone who) bought seed there)	3.709	1	5	0.946	730
Farmer's rating of particular shop on location	3.874	1	5	1.156	730
Farmer's rating of particular shop on price	3.249	1	5	1.109	730
Farmer's rating of particular shop on product quality	3.780	1	5	1.015	730
Farmer's rating of particular shop on seed stock/availability	3.892	1	5	1.030	730
Farmer's rating of particular shop on reputation/reliability	4.133	1	5	0.910	730
Farmer's rating of particular shop's maize seed on general quality	3.788	1	5	0.841	711
Farmer's rating of particular shop's maize seed on yield	3.542	1	5	0.881	699
Farmer's rating of particular shop's maize seed on drought tolerance	2.997	1	5	0.858	679
Farmer's rating of particular shop's maize seed on pest/disease tolerance	2.446	1	5	0.904	685
Farmer's rating of particular shop's maize seed on timing of maturity	3.845	1	5	0.695	688
Farmer's rating of particular shop's maize seed on germination	3.679	1	5	0.854	699

Table 8: Orthogonality tests of randomization balance - Agro-input dealer (baseline)

	mean	dealer training	clearing house	farmer video
Respondent's age in years	32.427	2.024	-0.039	-2.662
	(11.492)	(3.171)	(2.664)	(2.483)
Respondent is male	0.595	-0.057	0.054	0.080
	(0.492)	(0.142)	(0.132)	(0.107)
Respondent finished primary education	0.920	0.018	-0.080	-0.002
	(0.271)	(0.046)	(0.055)	(0.060)
Shop's distance to nearest tarmac road in km	6.556	2.642	0.896	-1.307
	(10.390)	(3.628)	(3.360)	(2.288)
Number of customers per day	41.486	8.954	-3.565	-4.755
	(46.489)	(11.999)	(8.797)	(10.085)
Years since shop establishment	5.339	-0.362	0.208	-0.124
	(6.299)	(1.845)	(1.588)	(1.380)
Respondent received training on maize seed handling/storage	0.526	-0.052	0.006	-0.011
	(0.500)	(0.122)	(0.136)	(0.108)
Number of maize varieties in stock	2.917	-0.357	-0.199	0.118
	(1.755)	(0.338)	(0.371)	(0.377)
Amount of maize seed sold during last season in kg	910.885	562.086	131.991	-24.944
	(2683.235)	(849.800)	(405.968)	(585.445)
Amount of maize seed lost/wasted during last season in kg	3.504	-3.210	-1.869	-3.394
	(18.651)	(3.652)	(3.824)	(4.053)
Shop has problem with pests	0.649	0.076	-0.042	-0.085
	(0.478)	(0.119)	(0.111)	(0.104)
Shop has leak-proof roof	0.537	0.024	-0.006	0.011
	(0.499)	(0.118)	(0.101)	(0.109)
Shop received seed related complaint from customer	0.644	-0.257*	0.077	-0.040
	(0.480)	(0.111)	(0.083)	(0.103)
Respondent knows how seed should be stored after repackaging	0.270	0.048	0.095	-0.099
	(0.445)	(0.129)	(0.131)	(0.096)
Shop has trading license by local government	0.749	0.000	0.125	0.124
	(0.435)	(0.121)	(0.107)	(0.096)
Moisture in random seed bag in percent	13.576	0.393	0.267	0.621
	(1.522)	(0.555)	(0.363)	(0.409)
Random seed bag shows lot number	0.504	-0.006	0.013	-0.036
	(0.501)	(0.195)	(0.166)	(0.136)
Shop refunds if problem, according to farmers (who (know someone who) bought seed there)	0.331	-0.022	-0.083	0.018
	(0.302)	(0.091)	(0.088)	(0.067)
Shop gives credit, i.e. inputs one can pay later, according to farmers	0.410	0.059	0.091	0.050
	(0.313)	(0.076)	(0.085)	(0.070)
Shop provides after-sales service, according to farmers	0.241	0.107	0.086	0.100
	(0.288)	(0.071)	(0.061)	(0.062)
Number of observations	348	348	348	348

Note: First column reports sample means (and standard deviations below); **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop).

Table 9: Orthogonality tests of randomization balance - Farmer (baseline)

	mean	dealer training	clearing house	farmer video
Homestead's distance to nearest tarmac road in km	9.390	4.178	1.663	0.092
	(10.810)	(3.624)	(2.969)	(2.011)
Homestead's distance to nearest agro-input shop in km	3.779	-0.807	0.294	0.045
	(4.789)	(0.755)	(1.042)	(0.749)
Farmer's age in years	48.617	1.744	0.202	0.181
	(13.385)	(1.180)	(1.206)	(1.112)
Farmer is male	0.777	-0.053	-0.013	-0.047
	(0.416)	(0.046)	(0.049)	(0.044)
Farmer finished primary education	0.507	-0.073	0.003	-0.030
	(0.500)	(0.054)	(0.046)	(0.045)
Number of people in household (incl. respondent)	8.695	-0.123	0.035	0.401
	(3.979)	(0.423)	(0.328)	(0.353)
Number of rooms in house	3.490	-0.076	-0.081	-0.017
	(1.445)	(0.156)	(0.156)	(0.155)
Farmer's land for crop production in acres	3.348	0.342	-0.046	0.026
	(4.320)	(0.434)	(0.369)	(0.432)
Farmer used improved maize seed (OPV/hybrid) for any field last season	0.492	-0.020	-0.032	-0.041
	(0.500)	(0.048)	(0.039)	(0.043)
Farmer used improved maize seed bought at agro-input shop	0.325	0.002	-0.001	0.000
	(0.468)	(0.047)	(0.045)	(0.044)
Amount of improved maize seed bought from agro-input shop in kg (0 if not from shop)	3.533	-0.376	-0.784	-1.235
	(9.198)	(1.114)	(1.065)	(0.863)
Farmers thinks seed at agro-input shop is counterfeit/adulterated	0.685	0.021	-0.044	-0.023
	(0.465)	(0.066)	(0.078)	(0.058)
Randomly selected maize field was intercropped with beans	0.419	-0.042	-0.061	0.074
	(0.493)	(0.066)	(0.067)	(0.047)
Farmer used improved (not too often recyvled) maize seed for randomly selected field last season	0.477	-0.026	-0.053	-0.004
	(0.500)	(0.051)	(0.045)	(0.044)
Farmer's rating of maize seed planted on randomly selected maize field on general quality	3.385	-0.063	-0.061	-0.037
	(1.032)	(0.122)	(0.106)	(0.094)
Farmer applied organic manure on randomly selected maize field	0.074	-0.036	-0.017	-0.020
	(0.262)	(0.026)	(0.022)	(0.019)
Farmer planted at correct time on randomly selected maize field (1-3 days after 1st rains)	0.699	0.055	-0.048	-0.017
	(0.459)	(0.048)	(0.052)	(0.051)
Yield in kg (number of harvested maize bags x kg per bag)	544.188	-127.100	-160.308	-130.885
	(858.238)	(94.066)	(97.963)	(95.228)
Land productivity in kg/acre (yield/area)	499.517	-60.344	-52.807	-26.771
	(771.173)	(41.873)	(45.528)	(43.390)
Farmer sold maize from randomly selected maize field	0.513	0.056	-0.026	0.001
	(0.500)	(0.054)	(0.058)	(0.046)
Number of observations	3470	3470	3470	3470

Note: First column reports sample means (and standard deviations below); **, * and + denote significance at the 1, 5 and 10 percent level. Reported standard errors are clustered at the level of randomization (catchment area or village/shop).

and wrote down eye-catching features to later identify it. Based on this information, enumerators will trace missing participants for mid- and endline data collection. Due to these measures and because the surveys are conducted over a reasonably short time period, we expect most baseline respondents to also be available for the mid- and endline survey and hence low attrition rates.

Table 10 simulates attrition levels in the treatment and comparison groups. Tables **??** and **??** use this simulated attrition to show how we will test whether attritors and non-attritors differ systematically in our baseline data, at least along observable dimensions. In these tests of survey attrition we include the same variables as in our tests of randomization balance.

right:

If attritors and non-attritors differ significantly and attrition could bias our estimates, we will exploit statistical techniques to identify and adjust for this bias. Manski (1989) and Lee (2002) for example suggest non-parametric bounds on the treatment effect that can be estimated from available data.

Written in May 2022:

Despite our efforts to minimize attrition, we failed to collect midline data from 12.07% of agro-input dealers who were part of the original sample. This reduces our statistical power. Furthermore, the probability that a dealer left the sample is correlated with the clearinghouse treatment status and this might bias the estimates.

Whether our estimates are biased or not depends on the reason why more agro-input dealers in the clearinghouse treatment group were found than in the clearinghouse control group. It is for example plausible that enumerators invested made less of an effort when finding clearinghouse control dealers because they did not have to deliver their SeedAdvisor certificates. Carrying this certificate might have made them more persistent when looking for a shop because they did not want to return to their supervisor without having delivered that paper. Moreover, the certificate might have helped the enumerators to find the treated dealers because they were able to show the names to neighbors etc. (instead of just asking) who in turn helped finding them. In that case, a larger number of random dealers left the control sample, meaning that the dealers who were not found are not different from the ones that were found. The subsample of dealers that remained in the control group would then be representative for the entire control group, hence our estimates would be unbiased.

On the other hand, a non-random subset of agro-input dealers might have left our sample. It is for example plausible that the worst performing shops in the clearinghouse control group went bankrupt. Our clearinghouse treatment might have prevented bankruptcy and helped dealers to stay in the market because it served as some kind of advertisement if the rating was good. Hence, as our treatment effects are positive, selection bias is most likely negative. Duflo, Glennerster and Kremer state in their famous toolkit for using randomization in development economics research that in this case, when attrition bias is negative and the treatment effect is positive, the ordinary unadjusted estimates provide a lower bounds for the true effect. In other words, selection-contaminated comparisons provide a lower bound on the impact of the treatment on the outcome

Table 10: Attrition levels in control and treatment groups

	all	control	dealer training	clearing house	farmer video
Number of attritors (dealers)	42	9	19	14	21
Number of dealers	348	42	166	193	175
Percentage of attritors (dealers)	12.07%	21.43%	11.45%	7.25%	12%
Number of attritors (farmers)	63	6	26	36	35
Number of farmers	3470	411	1660	1931	1750
Percentage of attritors (farmers)	1.82%	1.46%	1.57%	1.86%	2%

Table 11: Survey attrition

	mean	dealer training	clearing house	farmer video	number of observations
Agro-input dealer left the sample	0.121	-0.071	-0.152*	-0.028	348
	(0.326)	(0.082)	(0.064)	(0.070)	
Farmer left the sample	0.018	0.003	0.002	0.011	3470
	(0.134)	(0.012)	(0.010)	(0.011)	

Note: First column reports sample means (and standard deviations below); **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop).

variables (Angrist, Bettinger, Kremer, 2006). To construct upper bounds for treatment estimates that are robust to non-random attrition, we can use non-parametric approaches, for example the ones by Manski (1989) or Lee (2002). The upper bound on the treatment effect can be estimated from available data if we make plausible assumptions about the monotonicity of outcomes and attrition, and relative rank restrictions on the distribution of outcomes.

However, we refrain from estimating these upper Manski (1989) or Lee (2002) bounds at this point in time. Instead, we will increase our efforts to find every agro-input dealer at endline data collection. If a dealer is not found despite this, we will include the question why the dealer was not found in the ODK data collection app, and add answer options like shop closed, shop relocated, shop sells different products, dealer does not want to be interviewed, shop could not be located etc. If attrition remains correlated with the clearinghouse treatment, we can use this information to check the assumptions mentioned above, and to eventually estimate the upper bounds. At this point, we do not know which dealers have left our sample, and therefore choose the most conservative approach, namely to look at the ordinary unadjusted estimates, which are lower bounds for the true effect.

Outcome variables

The remaining tables (Table 12 to 34) all test differences between treatment and control groups for the three hypotheses. We have separate sections for outcomes at the agro-input dealer level and the farmer level. We also define a set of primary outcomes to test overall impact and various secondary outcomes to explore impact more in detail and look at mechanisms. We generally provide two tables: and one where p-values are adjusted using the method outlined in **sankoh1997some**.

Agro-input dealer

We start with outcomes at the agro-input dealer level (Tables 12 to 24).

Primary

Primary outcomes at the dealer level are are reported in Table 12 with associated table that corrects p-values for multiple hypothesis testing in Table 13.

Some outcome variables are not included in the overall index: The average sales price of 4 improved maize varieties last season is not included because the impact of the treatments on this outcome is ambiguous (increased adoption could eg. increase demand and hence prices but dealers could also lower prices to be more customer friendly). The index of all seed handling and storage practices is not included because it is a function of the index of capital-intensive practices and the index of labor-intensive practices, which are both included in the index. The index of shop's maize seed ratings by farmers is not included

Table 12: Differences between treatment and control groups - Agro-input dealer, primary outcome variables

	mean	dealer training	clearing house	farmer video	nobs
Cumulative quantity sold of 4 improved maize varieties last season in kg†	979.738	474.186	203.417	207.314	292
	(1620.296)	(445.657)	(198.567)	(312.788)	
Average sales price of 4 improved maize varieties last season in UGX/ kg	4537.728	-337.301	35.207	-63.885	275
	(871.743)	(210.807)	(265.212)	(211.693)	
Transformed seed revenue in mln UGX: quantities sold * sales prices of 4 maize varieties (IHS)†	1.494	0.105	0.217	0.152	292
	(1.076)	(0.246)	(0.201)	(0.198)	
Transformed number of customers who bought maize seed on average day at last season (IHS)†	3.230	0.084	0.206	0.089	294
	(0.824)	(0.230)	(0.207)	(0.189)	
Moisture in random seed bag in percent†	12.948	-0.134	0.163	-0.272	135
	(0.848)	(0.421)	(0.335)	(0.288)	
Index of **capital-intensive** seed handling and storage practices observed by enumerator †	0.021	-0.017	-0.026	0.166	270
	(0.493)	(0.134)	(0.136)	(0.119)	
Index of **labor-intensive** seed handling and storage practices observed by enumerator †	0.005	0.202^{+}	0.135	-0.098	285
	(0.457)	(0.111)	(0.111)	(0.114)	
Index of **all** seed handling and storage practices observed by enumerator	0.013	0.127	0.039	0.009	251
	(0.360)	(0.096)	(0.103)	(0.094)	
Index of dealer's efforts and services †	-0.007	-0.017	0.165	0.142	243
	(0.413)	(0.113)	(0.110)	(0.117)	
Index of shop's maize seed ratings by farmers (no base or midline)					
Overall index controlling for baseline (nobs bc of moisture)	0.132	0.316	0.100	0.100	82
	(0.493)	(0.427)	(0.374)	(0.238)	
Overall index not controlling for baseline (nobs bc of moisture)	0.132	0.258	0.201	0.112	119
	(0.493)	(0.319)	(0.298)	(0.199)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 13: Differences between treatment and control groups - Agro-input dealer, primary outcome variables: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Cumulative quantity sold of 4 improved maize varieties last season in kg†	979.738	474.186	203.417	207.314	292
	(1620.296)	(445.657)	(198.567)	(312.788)	
Average sales price of 4 improved maize varieties last season in UGX/ kg	4537.728	-337.301	35.207	-63.885	275
	(871.743)	(210.807)	(265.212)	(211.693)	
Transformed seed revenue in mln UGX: quantities sold * sales prices of 4 maize varieties (IHS)†	1.494	0.105	0.217	0.152	292
	(1.076)	(0.246)	(0.201)	(0.198)	
Transformed number of customers who bought maize seed on average day at last season (IHS)†	3.230	0.084	0.206	0.089	294
	(0.824)	(0.230)	(0.207)	(0.189)	
Moisture in random seed bag in percent†	12.948	-0.134	0.163	-0.272	135
	(0.848)	(0.421)	(0.335)	(0.288)	
Index of **capital-intensive** seed handling and storage practices observed by enumerator †	0.021	-0.017	-0.026	0.166	270
	(0.493)	(0.134)	(0.136)	(0.119)	
Index of **labor-intensive** seed handling and storage practices observed by enumerator †	0.005	0.202	0.135	-0.098	285
	(0.457)	(0.111)	(0.111)	(0.114)	
Index of **all** seed handling and storage practices observed by enumerator	0.013	0.127	0.039	0.009	251
	(0.360)	(0.096)	(0.103)	(0.094)	
Index of dealer's efforts and services †	-0.007	-0.017	0.165	0.142	243
	(0.413)	(0.113)	(0.110)	(0.117)	
Index of shop's maize seed ratings by farmers (no base or midline)					

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

because the questions to compute this index are only collected for all dealers at endline (at midline, these variables are only collected for clearinghouse treated farmers as rating is part of the clearinghouse treatment).

Secondary

Indices As a first set of secondary outcomes, we construct a series of indices to assess things like motivation, knowledge etc. This is reported in table 14. The outcome variables in 14 are not further adjusted for multiple hypothesis testing by means of an overall index or p-values adjusted according to **sankoh1997some** because they are all indices.

Other secondary A second family of secondary outcomes are in Table 15 with associated Table 16 that adjusts for multiple comparisons.

Some outcome variables are not included in the overall index: The number of maize varieties in stock last season is not included because it is a function of the number of hybrid maize varieties and the number of open-pollinated maize varieties which are both included in the index. Whether the shop has equipment to monitor seed moisture or not is also not included because we provide dealers with this equipment as part of the dealer training. Including this outcome in the overall index would bias our results.

Longe 10H We also look at outcomes for particular seed types. Table 17 looks at farmer level outcomes related to a popular hybrid maize seed, while Table 18 gives the same information but adjusted for multiple comparisons.

Some outcome variables are not included in the overall index: The transformed sales price of Longe 10H per kg at beginning of last season (IHS) is not included because the impact of the treatments on this outcome is ambiguous (increased adoption could eg. increase demand and hence prices but dealers could also lower prices to be more customer friendly). The transformed amount of Longe 10H lost/wasted last season (IHS) is not included because many observations are missing at baseline. After midline data collection, we will check whether as many observations are missing and if we have significantly more observations, include the outcome using a regression that does not control for the baseline value. The number of times the shop ran out of Longe 10H last season is not included because the impact of the treatments on this outcome is ambiguous (increased adoption could eg. increase demand and hence this number but the training could improve management and planning, hence decrease it). Furthermore, this number mostly depends on parameters further up the value chain.

Longe 5 Table 19 looks at farmer level outcomes related to a popular OPV maize seed, while Table 20 gives the same information but adjusted for multiple comparisons.

Some outcome variables are not included in the overall index: please see explanations for Longe 10H.

Table 14: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding indices

	mean	dealer training	clearing house	farmer video	nobs
Index of dealer's motivation and satisfaction	0.000	-0.112	-0.071	0.088	306
	(0.674)	(0.175)	(0.187)	(0.156)	
Index of dealer's self-ratings on location, price, product quality, stock, reputation	0.000	0.137	0.144	0.056	306
	(0.626)	(0.146)	(0.159)	(0.150)	
Index of dealer's efforts and services according to farmers	0.001	-0.297*	0.232*	0.027*	259
	(0.552)	(0.144)	(0.086)	(0.119)	
Index of dealer's knowledge about seed storage	0.000	0.162	0.116	0.020	306
	(0.511)	(0.145)	(0.129)	(0.119)	
Index of dealer's knowledge about seed	0.000	0.019	-0.031	0.117	306
	(0.530)	(0.115)	(0.121)	(0.131)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop).

Table 15: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables

	mean	dealer training	clearing house	farmer video	nobs
Number of maize varieties in stock last season (incl. hybrids, OPV, landraces)	3.736	-0.428	0.241	0.037	295
	(1.665)	(0.379)	(0.350)	(0.393)	
Number of **hybrid** maize varieties in stock last season†	2.397	-0.469	-0.021	0.043	301
	(1.352)	(0.317)	(0.325)	(0.296)	
Number of **open-pollinated** maize varieties in stock last season†	1.374	-0.268	-0.168	-0.251	301
	(0.775)	(0.186)	(0.204)	(0.180)	
Shop has equipment to monitor seed moisture	0.369	0.773**	-0.007	0.030	306
	(0.483)	(0.077)	(0.039)	(0.081)	
Overall index controlling for baseline	-0.008	-0.371+	-0.142	-0.166	296
	(0.790)	(0.195)	(0.195)	(0.183)	
Overall index not controlling for baseline	-0.008	-0.294	-0.073	-0.090	298
	(0.790)	(0.218)	(0.213)	(0.200)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 16: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Number of maize varieties in stock last season (incl. hybrids, OPV, landraces)	3.736	-0.428	0.241	0.037	295
	(1.665)	(0.379)	(0.350)	(0.393)	
Number of **hybrid** maize varieties in stock last season†	2.397	-0.469	-0.021	0.043	301
	(1.352)	(0.317)	(0.325)	(0.296)	
Number of **open-pollinated** maize varieties in stock last season†	1.374	-0.268	-0.168	-0.251	301
	(0.775)	(0.186)	(0.204)	(0.180)	
Shop has equipment to monitor seed moisture	0.369	0.773**	-0.007	0.030	306
	(0.483)	(0.077)	(0.039)	(0.081)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 17: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding Longe 10H (most common hybrid variety in area) (selection: if shop had Longe 10H in stock last season)

	mean	dealer training	clearing house	farmer video	nobs
Transformed amount of Longe 10H carried into last season from previous season in kg (IHS)†	0.698	-0.057	0.053	-0.150	262
	(1.550)	(0.418)	(0.459)	(0.385)	
Transformed amount of Longe 10H bought by shop from provider last season in kg (IHS)†	6.023	0.268	0.365	0.238	257
	(1.357)	(0.374)	(0.338)	(0.307)	
Cost of Longe 10H per kg last season in UGX†	5100.973	-59.560	59.758	102.812	180
	(898.767)	(236.148)	(269.380)	(229.678)	
Transformed quantity of Longe 10H sold last season in kg (IHS)†	5.934	0.313	0.373	0.214	256
	(1.311)	(0.363)	(0.331)	(0.300)	
Transformed sales price of Longe 10H per kg at beginning of last season in UGX (IHS)	9.415	0.035	0.024	0.066	194
	(0.156)	(0.054)	(0.047)	(0.045)	
Transformed amount of Longe 10H lost/wasted last season in kg (IHS)	0.169	-0.539	-0.392	-0.433^{+}	133
	(0.693)	(0.398)	(0.412)	(0.247)	
Number of times per month shop ran out of Longe 10H last season	1.172	-0.185	-0.065	-0.111	192
	(1.678)	(0.594)	(0.517)	(0.500)	
Overall index controlling for baseline	-0.002	-0.007	0.028	0.077	169
	(0.517)	(0.134)	(0.156)	(0.139)	
Overall index not controlling for baseline	-0.002	0.165	0.155	0.102	247
	(0.517)	(0.144)	(0.162)	(0.132)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 18: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding Longe 10H (most common hybrid variety in area): P-values adjusted according to Sankoh, Huque, Dubey (1997) (selection: if shop had Longe 10H in stock last season)

	mean	dealer training	clearing house	farmer video	nobs
Transformed amount of Longe 10H carried into last season from previous season in kg (IHS)†	0.698	-0.057	0.053	-0.150	262
	(1.550)	(0.418)	(0.459)	(0.385)	
Transformed amount of Longe 10H bought by shop from provider last season in kg (IHS)†	6.023	0.268	0.365	0.238	257
	(1.357)	(0.374)	(0.338)	(0.307)	
Cost of Longe 10H per kg last season in UGX†	5100.973	-59.560	59.758	102.812	180
	(898.767)	(236.148)	(269.380)	(229.678)	
Transformed quantity of Longe 10H sold last season in kg (IHS)†	5.934	0.313	0.373	0.214	256
	(1.311)	(0.363)	(0.331)	(0.300)	
Transformed sales price of Longe 10H per kg at beginning of last season in UGX (IHS)	9.415	0.035	0.024	0.066	194
	(0.156)	(0.054)	(0.047)	(0.045)	
Transformed amount of Longe 10H lost/wasted last season in kg (IHS)	0.169	-0.539	-0.392	-0.433	133
	(0.693)	(0.398)	(0.412)	(0.247)	
Number of times per month shop ran out of Longe 10H last season	1.172	-0.185	-0.065	-0.111	192
	(1.678)	(0.594)	(0.517)	(0.500)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 19: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding Longe 5 (most common open-pollinated variety) (selection: if shop had Longe 5 in stock last season)

	mean	dealer training	clearing house	farmer video	nobs
Transformed amount of Longe 5 carried into last season from previous season in kg (IHS)†	0.895	-0.084	-0.066	-0.034	270
	(1.807)	(0.465)	(0.522)	(0.464)	
Transformed amount of Longe 5 bought by shop from provider last season in kg (IHS)†	6.116	0.209	0.279	0.058	262
	(1.438)	(0.351)	(0.378)	(0.326)	
Cost of Longe 5 per kg last season in UGX†	2518.061	-29.755	-106.767	-101.862	231
	(318.852)	(117.254)	(109.457)	(67.828)	
Transformed quantity of Longe 5 sold last season in kg (IHS)†	6.015	0.054	0.363	0.190	261
	(1.446)	(0.340)	(0.364)	(0.323)	
Transformed sales price of Longe 5 per kg at beginning of last season in UGX (IHS)	8.747	-0.014	-0.035	-0.049+	249
	(0.128)	(0.040)	(0.037)	(0.029)	
Transformed amount of Longe 5 lost/wasted last season in kg (IHS)	0.357	-0.105	0.069	-0.203	167
	(1.025)	(0.536)	(0.445)	(0.385)	
Number of times per month shop ran out of Longe 5 last season	0.876	0.097	0.211	-0.142	248
	(1.504)	(0.475)	(0.398)	(0.406)	
Overall index controlling for baseline	0.011	-0.023	-0.097	-0.114	218
	(0.481)	(0.127)	(0.116)	(0.131)	
Overall index not controlling for baseline	0.011	0.034	-0.070	-0.047	255
	(0.481)	(0.142)	(0.127)	(0.126)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 20: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding Longe 5 (most common open-pollinated variety): P-values adjusted according to Sankoh, Huque, Dubey (selection: if shop had Longe 5 in stock last season)

	mean	dealer training	clearing house	farmer video	nobs
Transformed amount of Longe 5 carried into last season from previous season in kg (IHS)†	0.895	-0.084	-0.066	-0.034	270
	(1.807)	(0.465)	(0.522)	(0.464)	
Transformed amount of Longe 5 bought by shop from provider last season in kg (IHS)†	6.116	0.209	0.279	0.058	262
	(1.438)	(0.351)	(0.378)	(0.326)	
Cost of Longe 5 per kg last season in UGX†	2518.061	-29.755	-106.767	-101.862	231
	(318.852)	(117.254)	(109.457)	(67.828)	
Transformed quantity of Longe 5 sold last season in kg (IHS)†	6.015	0.054	0.363	0.190	261
	(1.446)	(0.340)	(0.364)	(0.323)	
Transformed sales price of Longe 5 per kg at beginning of last season in UGX (IHS)	8.747	-0.014	-0.035	-0.049	249
	(0.128)	(0.040)	(0.037)	(0.029)	
Transformed amount of Longe 5 lost/wasted last season in kg (IHS)	0.357	-0.105	0.069	-0.203	167
	(1.025)	(0.536)	(0.445)	(0.385)	
Number of times shop per month ran out of Longe 5 last season	0.876	0.097	0.211	-0.142	248
	(1.504)	(0.475)	(0.398)	(0.406)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Registration/ trading license/ membership/ inspection We now turn to outcomes that are related to registration and quality control (Tables 21 and 22).

Some outcome variables are not included in the overall index: The transformed number of times shop was inspected by DAO/MAAIF/UNADA last year (IHS) is not included because the impact of the treatments on this outcome is ambiguous (eg. more dealers could ask to be inspected to receive a certificate and signal quality which would increase the number but the treatments could also improve quality which could make inspections less necessary and common).

Seed bag Finally, in each shop, we purchase a random seed bag which is then analyzed. Tables 23 and 24 provides comparisons.

Farmer

We now turn to the impact of the interventions at the farmer level.

Primary

We first define a set of key outcomes. These are in Tables 25 and 26.

Some outcome variables are not included in the overall index: The index of farmer's maize seed ratings for shops nearby and the index of farmer's general ratings of shops nearby are not included because the questions to compute these indeces are only collected from all farmers at endline (at midline, these variables are only collected from clearinghouse treated farmers as rating is part of the clearinghouse treatment). The index of services of shops nearby according to farmers is not included because many observations are missing at baseline. After midline data collection, we will check whether as many observations are missing and if we have significantly more observations, include the outcome using a regression that does not control for the baseline value. Whether the farmer switched to a different agro-input shop or not is only included in the regression that does not control for the baseline value because we did not ask this question at baseline.

Secondary

Other secondary We further register a family of secondary outcomes that are somewhat unrelated to each other in Tables 27 and 28. Some outcome variables are not included in the overall index: The index of farmer skills is not included because the questions to compute this index are only collected at endline to avoid priming.

Adoption on randomly selected maize field We also look at plot level outcomes (Tables 29 and 30).

Some outcome variables are not included in the overall index: Whether the farmer planted hybrid not farmer saved seed or an OPV (not used too often) on

Table 21: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding registration/ trading license/ membership/ inspection

	mean	dealer training	clearing house	farmer video	nobs
Shop is registered with UNADA†	0.397	0.133	0.042	0.103	252
	(0.490)	(0.112)	(0.128)	(0.126)	
Shop has a trading license issued by local government†	0.831	-0.051	-0.102	0.003	288
	(0.375)	(0.103)	(0.100)	(0.095)	
Shop is a member of other professional association†	0.265	-0.013	0.142	-0.007	268
	(0.442)	(0.100)	(0.114)	(0.122)	
Transformed number of times shop was inspected by DAO/MAAIF/UNADA last year (IHS)	1.347	-0.421	-0.733	-0.007	293
	(1.782)	(0.582)	(0.542)	(0.442)	
Shop received a warning after inspection†	0.396	0.094	0.042	0.079	291
	(0.490)	(0.130)	(0.120)	(0.123)	
Shop's products were confiscated after inspection†	0.129	-0.019	-0.020	0.038	293
	(0.335)	(0.075)	(0.084)	(0.082)	
Overall index controlling for baseline	-0.020	-0.011	-0.061	-0.017	228
	(0.498)	(0.130)	(0.152)	(0.145)	
Overall index not controlling for baseline	-0.020	0.006	-0.024	-0.006	266
	(0.498)	(0.126)	(0.141)	(0.132)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 22: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding registration/ trading license/ membership/ inspection: P-values adjusted according to Sankoh, Huque, Dubey

	mean	dealer training	clearing house	farmer video	nobs
Shop is registered with UNADA†	0.397	0.133	0.042	0.103	252
	(0.490)	(0.112)	(0.128)	(0.126)	
Shop has a trading license issued by local government†	0.831	-0.051	-0.102	0.003	288
	(0.375)	(0.103)	(0.100)	(0.095)	
Shop is a member of other professional association†	0.265	-0.013	0.142	-0.007	268
	(0.442)	(0.100)	(0.114)	(0.122)	
Transformed number of times shop was inspected by DAO/MAAIF/UNADA last year (IHS)	1.347	-0.421	-0.733	-0.007	293
	(1.782)	(0.582)	(0.542)	(0.442)	
Shop received a warning after inspection†	0.396	0.094	0.042	0.079	291
	(0.490)	(0.130)	(0.120)	(0.123)	
Shop's products were confiscated after inspection†	0.129	-0.019	-0.020	0.038	293
	(0.335)	(0.075)	(0.084)	(0.082)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 23: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding seed bag (selection: enumerator was able to buy bag of seed)

	mean	dealer training	clearing house	farmer video	nobs
Random seed bag shows expiry date					
Random seed bag shows packaging date†	0.855	0.343*	0.290+	0.235*	144
	(0.353)	(0.131)	(0.141)	(0.116)	
Days since packaging date/expiry date minus 6 months†	159.524	-56.378	-77.316	-72.896+	102
	(94.440)	(63.961)	(44.925)	(39.083)	
Random seed bag shows lot number†	0.642	0.076	0.096	0.400+	144
	(0.481)	(0.215)	(0.202)	(0.161)	
Overall index controlling for baseline	-0.002	0.475	0.576	0.664+	102
	(0.652)	(0.339)	(0.375)	(0.258)	
Overall index not controlling for baseline	-0.002	0.376	0.317	0.495*	164
	(0.652)	(0.254)	(0.265)	(0.216)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 24: Differences between treatment and control groups - Agro-input dealer, secondary outcome variables regarding seed bag: P-values adjusted according to Sankoh, Huque, Dubey (selection: enumerator was able to buy bag of seed)

	mean	dealer training	clearing house	farmer video	nobs
Random seed bag shows expiry date					
Random seed bag shows packaging date†	0.855	0.343*	0.290	0.235	144
	(0.353)	(0.131)	(0.141)	(0.116)	
Days since packaging date/expiry date minus 6 months†	159.524	-56.378	-77.316	-72.896	102
	(94.440)	(63.961)	(44.925)	(39.083)	
Random seed bag shows lot number†	0.642	0.076	0.096	0.400+	144
	(0.481)	(0.215)	(0.202)	(0.161)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 25: Differences between treatment and control groups - Farmer, primary outcome variables

	mean	dealer training	clearing house	farmer video	nobs
Farmer used quality maize seed for any plot last season†	0.609	-0.080+	0.029	-0.047	3206
	(0.488)	(0.044)	(0.033)	(0.033)	
Farmer used quality maize seed bought at agro-input shop for any plot last season†	0.429	-0.045	0.028	-0.058+	3145
	(0.495)	(0.040)	(0.039)	(0.034)	
Transformed amount of quality maize seed farmer bought at agro-input shop last season in kg (IHS)†	1.025	-0.096	0.045	-0.182*	3025
	(1.284)	(0.109)	(0.099)	(0.090)	
Index of farmer's maize seed ratings for shops nearby (product quality perception) (only endline)					
Index of farmer's general ratings of shops nearby (shop/seller perception) (only endline)					
Index of services of shops nearby according to farmers (perception of services and efforts)	-0.022	-0.174	0.033	0.052	312
	(0.597)	(0.145)	(0.171)	(0.108)	
Farmer switched to different agro-input shop (no baseline)(†)	0.167	0.007	0.052+	-0.001	3470
	(0.373)	(0.030)	(0.029)	(0.026)	
Index of farmer's practices on randomly selected maize field†	0.008	-0.063	-0.035	-0.058*	2929
	(0.400)	(0.044)	(0.043)	(0.029)	
Farmer thinks that maize seed at agro-input shops is counterfeit/adulterated†	0.506	-0.035	-0.033	-0.014	2113
	(0.500)	(0.052)	(0.062)	(0.043)	
Farmer planted local land race maize seed on this field†	0.390	0.075	0.017	0.104**	2954
	(0.488)	(0.046)	(0.043)	(0.034)	
Overall index controlling for baseline	0.032	-0.015	0.034	-0.050	1686
	(0.598)	(0.078)	(0.079)	(0.056)	
Overall index not controlling for baseline	0.036	-0.041	0.027	-0.048	2367
	(0.561)	(0.070)	(0.073)	(0.046)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 26: Differences between treatment and control groups - Farmer, primary outcome variables: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Farmer used quality maize seed last season for any plot†	0.609	-0.080	0.029	-0.047	3206
	(0.488)	(0.044)	(0.033)	(0.033)	
Farmer used quality maize seed bought at agro-input shop last season for any plot†	0.429	-0.045	0.028	-0.058	3145
	(0.495)	(0.040)	(0.039)	(0.034)	
Transformed amount of quality maize seed farmer bought at agro-input shop last season in kg (IHS)†	1.025	-0.096	0.045	-0.182	3025
	(1.284)	(0.109)	(0.099)	(0.090)	
Index of farmer's maize seed ratings for shops nearby (product quality perception) (only endline)					
Index of farmer's general ratings of shops nearby (shop/seller perception) (only endline)					
Index of services of shops nearby according to farmers (perception of services and efforts)	-0.022	-0.174	0.033	0.052	312
	(0.597)	(0.145)	(0.171)	(0.108)	
Farmer switched to different agro-input shop (no baseline)(†)					
Index of farmer's practices on randomly selected maize field†	0.008	-0.063	-0.035	-0.058	2929
	(0.400)	(0.044)	(0.043)	(0.029)	
Farmer thinks that maize seed at agro-input shops is counterfeit/adulterated†	0.506	-0.035	-0.033	-0.014	2113
	(0.500)	(0.052)	(0.062)	(0.043)	
Farmer planted local land race maize seed on this field†	0.390	0.075	0.017	0.104*	2954
	(0.488)	(0.046)	(0.043)	(0.034)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 27: Differences between treatment and control groups - Farmer, secondary outcome variables

	mean	dealer training	clearing house	farmer video	nobs
Number of improved maize varieties the farmer is are aware of†	2.625	-0.331	-0.040	0.088	3217
	(1.577)	(0.215)	(0.193)	(0.107)	
Farmer knows particular shop in neighborhood†	0.652	-0.009	-0.031	-0.037	3267
	(0.384)	(0.045)	(0.055)	(0.024)	
Farmer bought shop's seed last season (only endline)					
Index of farmer skill questions (only endline)					
Overall index controlling for baseline	-0.001	-0.120	-0.056	-0.019	3185
	(0.766)	(0.090)	(0.104)	(0.050)	
Overall index not controlling for baseline	-0.001	-0.092	-0.199	-0.033	3196
	(0.766)	(0.120)	(0.126)	(0.054)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 28: Differences between treatment and control groups - Farmer, secondary outcome variables: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Number of improved maize varieties the farmer is are aware of†	2.625	-0.331^{NA}	-0.040^{NA}	0.088^{NA}	3217
	(1.577)	(0.215)	(0.193)	(0.107)	
Farmer knows particular shop in neighborhood†	0.652	-0.009^{NA}	-0.031^{NA}	-0.037^{NA}	3267
	(0.384)	(0.045)	(0.055)	(0.024)	
Farmer bought shop's seed last season (only endline)					
Index of farmer skill questions (only endline)					

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

this field is not included because it is a function of whether the farmer planted hybrid maize seed and whether the farmer planted open-pollinated maize seed, which are both included in the index.

Seed on randomly selected maize field We now go more into detail with respect the the seed that was used on the randomly selected field (Tables 31 and 32). Some outcome variables are not included in the overall index: The transformed cost of seed farmer used on this field last season (amount * price) (IHS) is not included because it is a function of the amount of seed and the price of seed, which are both included in the index.

Yield etc. on randomly selected maize field Finally, we look at production related outcomes and disposal of maize (Tables 33 and 34).

Some outcome variables are not included in the overall index: Production from this field last season is not included because it is included in the yield, which is included in the index. Whether the farmer harvested as much maize as expected from this field last season and whether he/she did not harvest as much maize as expected due to own mismanagement and the transformed amount kept as seed (IHS) are only included in the regressions that do not control for the baseline values because we did not ask these questions at baseline.

Table 29: Differences between treatment and control groups - Farmer, secondary outcome variables: adoption on randomly selected maize field

	mean	dealer training	clearing house	farmer video	nobs
Farmer planted hybrid maize seed on randomly selected maize field†	0.312	-0.057	-0.015	-0.031	2654
	(0.463)	(0.041)	(0.046)	(0.034)	
Farmer planted open-pollinated maize seed on this field†	0.273	-0.016	0.003	-0.073*	2654
	(0.446)	(0.052)	(0.055)	(0.034)	
Farmer planted farmer saved maize seed on this field (can be hybrid, open-pollinated, local land race)†	0.518	0.059	-0.020	0.077*	3153
	(0.500)	(0.045)	(0.040)	(0.034)	
Farmer planted maize seed bought at agro-input shop on this field†	0.422	-0.028	0.020	-0.048	3153
	(0.494)	(0.045)	(0.045)	(0.034)	
Farmer planted hybrid **not farmer saved** seed or an OPV (**not used too often**) on this field	0.544	-0.052	0.001	-0.090*	2954
	(0.498)	(0.045)	(0.042)	(0.035)	
Overall index controlling for baseline	0.005	-0.068	-0.013	-0.092*	2604
	(0.518)	(0.054)	(0.046)	(0.038)	
Overall index not controlling for baseline	0.005	-0.066	-0.020	-0.088*	2867
	(0.518)	(0.063)	(0.050)	(0.039)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 30: Differences between treatment and control groups - Farmer, secondary outcome variables: adoption on randomly selected maize field: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Farmer planted hybrid maize seed on randomly selected maize field†	0.312	-0.057	-0.015	-0.031	2654
	(0.463)	(0.041)	(0.046)	(0.034)	
Farmer planted open-pollinated maize seed on this field†	0.273	-0.016	0.003	-0.073	2654
	(0.446)	(0.052)	(0.055)	(0.034)	
Farmer planted farmer saved maize seed on this field (can be hybrid, open-pollinated, local land race)†	0.518	0.059	-0.020	0.077^{+}	3153
	(0.500)	(0.045)	(0.040)	(0.034)	
Farmer planted maize seed bought at agro-input shop on this field†	0.422	-0.028	0.020	-0.048	3153
	(0.494)	(0.045)	(0.045)	(0.034)	
Farmer planted hybrid **not farmer saved** seed or an OPV (**not used too often**) on this field	0.544	-0.052	0.001	-0.090^{+}	2954
	(0.498)	(0.045)	(0.042)	(0.035)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 31: Differences between treatment and control groups - Farmer, secondary outcome variables: seed used on randomly selected maize field

	mean	dealer training	clearing house	farmer video	nobs
Index of farmer's ratings of seed used on randomly selected maize field last season†	0.005	0.019	0.120^{+}	-0.047	2317
	(0.483)	(0.081)	(0.063)	(0.040)	
Farmer was satisfied with quality of seed used on this field last season†	0.707	0.003	0.020	-0.038	3217
	(0.455)	(0.052)	(0.057)	(0.032)	
Farmer would use the seed used on this field last season again†	0.733	0.013	0.023	-0.046	3217
	(0.443)	(0.038)	(0.037)	(0.032)	
Amount of seed farmer used on this field last season in kg†	6.857	0.617	-0.294	0.078	2909
	(4.761)	(0.599)	(0.439)	(0.337)	
Price of seed farmer used on this field last season per kg in UGX†	2211.631	-412.936^{+}	63.390	-254.704	2982
	(3028.716)	(223.128)	(207.265)	(212.183)	
Transformed cost of seed farmer used on this field last season in UGX (amount*price) (IHS)	4.571	-0.427	0.375	-0.521	2848
	(5.312)	(0.493)	(0.474)	(0.386)	
Overall index controlling for baseline	0.013	-0.004	0.112*	-0.082	1985
	(0.574)	(0.062)	(0.054)	(0.051)	
Overall index not controlling for baseline	0.013	-0.045	0.086	-0.063	2483
	(0.574)	(0.065)	(0.057)	(0.047)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 32: Differences between treatment and control groups - Farmer, secondary outcome variables: seed used on randomly selected maize field: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Index of farmer's ratings of seed used on randomly selected maize field last season†	0.005	0.019	0.120	-0.047	2317
	(0.483)	(0.081)	(0.063)	(0.040)	
Farmer was satisfied with quality of seed used on this field last season†	0.707	0.003	0.020	-0.038	3217
	(0.455)	(0.052)	(0.057)	(0.032)	
Farmer would use the seed used on this field last season again†	0.733	0.013	0.023	-0.046	3217
	(0.443)	(0.038)	(0.037)	(0.032)	
Amount of seed farmer used on this field last season in kg†	6.857	0.617	-0.294	0.078	2909
	(4.761)	(0.599)	(0.439)	(0.337)	
Price of seed farmer used on this field last season per kg in UGX†	2211.631	-412.936	63.390	-254.704	2982
	(3028.716)	(223.128)	(207.265)	(212.183)	
Transformed cost of seed farmer used on this field last season in UGX (amount*price) (IHS)	4.571	-0.427	0.375	-0.521	2848
	(5.312)	(0.493)	(0.474)	(0.386)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 33: Differences between treatment and control groups - Farmer, secondary outcome variables: yield etc. on randomly selected maize field

	mean	dealer training	clearing house	farmer video	nobs
Production from this field last season in kg (number of harvested maize bags x kg per bag)	300.256	25.717	-5.026	41.792*	2884
	(277.792)	(39.381)	(37.022)	(19.579)	
Yield in kg/acre (production/area)†	335.023	-19.463	-4.379	37.658*	2878
	(260.714)	(40.253)	(43.859)	(19.127)	
Farmer harvested as much maize as expected from this field last season (no baseline)(†)	0.154	-0.001	-0.027	0.042	3200
	(0.361)	(0.055)	(0.047)	(0.026)	
Farmer did not harvest as much maize as expected due to own mismanagement (no baseline)(†)	0.102	-0.023	-0.005	-0.038+	2981
	(0.303)	(0.043)	(0.039)	(0.023)	
Transformed amount of maize sold from this field in kg (IHS)†	1.612	0.190	-0.118	0.213	3063
	(2.665)	(0.259)	(0.241)	(0.189)	
Transformed revenue in UGX (number of sold maize bags x price per bag) (IHS)†	3.331	0.512	-0.069	0.592	3058
	(5.507)	(0.539)	(0.489)	(0.393)	
Transformed amount kept as seed in kg (IHS) (no baseline)(†)	1.774	0.107	-0.042	0.284*	2931
	(1.654)	(0.191)	(0.149)	(0.125)	
Overall index controlling for baseline	-0.015	0.001	-0.018	0.117+	2742
	(0.806)	(0.109)	(0.112)	(0.062)	
Overall index not controlling for baseline	-0.114	-0.012	-0.004	-0.021	2124
	(0.422)	(0.061)	(0.037)	(0.040)	

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.

Table 34: Differences between treatment and control groups - Farmer, secondary outcome variables: yield etc. on randomly selected maize field: P-values adjusted according to Sankoh, Huque, Dubey (1997)

	mean	dealer training	clearing house	farmer video	nobs
Production from this field last season in kg (number of harvested maize bags x kg per bag)	300.256	25.717	-5.026	41.792^{+}	2884
	(277.792)	(39.381)	(37.022)	(19.579)	
Yield in kg/acre (production/area)†	335.023	-19.463	-4.379	37.658^{+}	2878
	(260.714)	(40.253)	(43.859)	(19.127)	
Farmer harvested as much maize as expected from this field last season (no baseline)$^{(\dagger)}$					
Farmer did not harvest as much maize as expected due to own mismanagement (no baseline)$^{(\dagger)}$					
Transformed amount of maize sold from this field in kg (IHS)†	1.612	0.190	-0.118	0.213	3063
	(2.665)	(0.259)	(0.241)	(0.189)	
Transformed revenue in UGX (number of sold maize bags x price per bag) (IHS)†	3.331	0.512	-0.069	0.592	3058
	(5.507)	(0.539)	(0.489)	(0.393)	
Transformed amount kept as seed in kg (IHS) (no baseline)$^{(\dagger)}$					

Note: First column reports means of the entire sample (control and treatment groups: only 12 percent of dealers were not treated, rest was treated somehow) and standard deviations below in brackets; **, * and + denote significance at the 1, 5 and 10 percent levels. Reported standard errors are clustered at the level of randomization (catchment area or village/shop). † indicates that the variable was included in the overall index.