# The Adoption of Climate-Resilient Groundnut Varieties Increases Agricultural Production and Smallholder Commercialization in West Africa

Supplementary Information (Full model tables and robustness check)

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#### 1 Supplementary Note

We present the results of the estimation using the pooled FE-OLS model. Figure S1 presents the results of the relationship between the adoption of climate-resilient groundnut varieties and commercialization where we employ the linear probability model for binary outcomes. We present results when we consider adoption as a dummy and the extent of adoption of climate-resilient groundnut varieties. Considering adoption as a dummy, we establish a positive association with the commercialization outcomes; market participation, quantity of groundnut sold, and sales. Considering the area under adoption, we obtain negative estimates that are not statistically significant. However, this result could mean that increasing the area of cultivation of improved climate-resilient groundnut varieties is negatively correlated with market participation, quantity sold and the associated sales value. This negative relationship although not statistically significant could be due to diminishing returns when we consider the area under adoption. Otherwise, these negative results could be due to endogeneity issues which could lead to biased estimates. Given that we control for these endogeneity issues using the 2SLS and both household fixed effects and the correlated random effects model, we only use these results for comparison with the main estimation results.

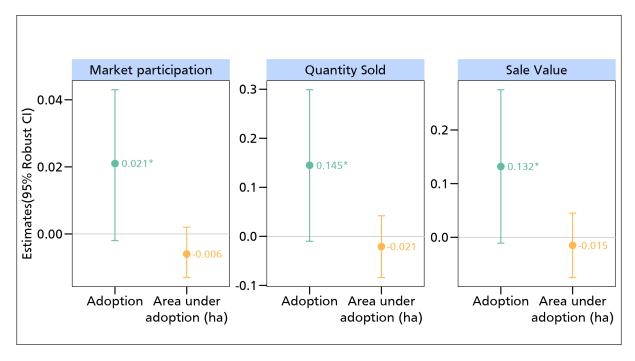


Figure 1: OLS estimates of the relationship between adoption and commercialization

Note: Full models are reported in SM2. Robust standard errors in parentheses. Additional controls include age and educational level of the household head, dependency ratio, whether the household head is male, household size, cooperative membership, training, access to public and private extension, access to credits both in

Estimating the relationship between adoption of improved groundnuts, production, production value and land productivity using the FE-OLS model (Figure S2), we obtain positive coefficients for all outcomes. When we consider adoption as a dummy, we observe production and productivity increases of about 540Kg and 285Kg/ha respectively. Considering the scale of adoption, we observe that adoption of improved climate-smart groundnut varieties increases groundnut production by 240Kg and land productivity by approximately 60Kg/ha. The magnitudes here are positive indicating that adoption both when considered as a dummy as well as extent increases yield, production, and production value. The smaller magnitudes here might be indicative of diminishing returns as early highlighted. The positive and significant estimates of the area under adoption variable aligns with the tenets of the non-separable agricultural household model where the production, consumption and ultimately commercialization decisions of households are non-separable. This suggests that households would only participate in markets to the extent that the household food production and consumption needs are met.

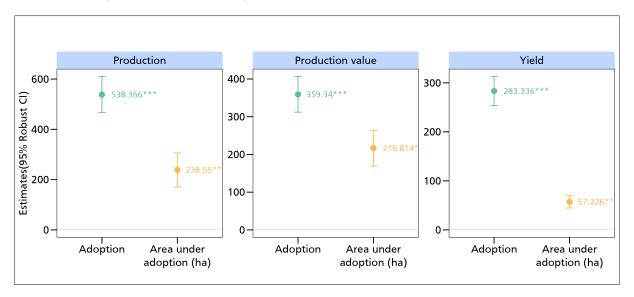


Figure 2: OLS estimates of the relationship between adoption and commercialization

Note: Full models are reported in SM4. Robust standard errors in parentheses). Additional controls include age and educational level of the household head, dependency ratio, whether the household head is male, household size, cooperative membership, training, access to public and private extension, access to credits both in cash and kind, distance to nearest urban and village market, crop rotation, mixed cropping, labour, market price, input costs, area of cultivation, off-farm income and soil type (\*\*\* p<0.01, \*\* p<0.05, \* p<0.1)

2 Descriptive statistics

Table SM1: Descriptive statistics by year and adoption status

	2017, N = 2868			2018	8, N = 2868	2019, N = 2868			
Characteristic	Non-adopter, $N = 1,809$	Adopter, $N = 1,059$	p-value	Non-adopter, $N = 1,770$	Adopter, $N = 1,098$	p-value	Non-adopter, N = 1,670	Adopter, $N = 1,198$	p-value
Country			< 0.001			< 0.001			< 0.001
Ghana	327 (18%)	171 (16%)		353 (20%)	145 (13%)		340 (20%)	158 (13%)	
Mali	697 (39%)	143 (14%)		693 (39%)	147 (13%)		642 (38%)	198 (17%)	
Nigeria	785 (43%)	745 (70%)		724 (41%)	806 (73%)		688 (41%)	842 (70%)	
Age of household head (years)	48 (13)	47 (11)	0.073	49 (13)	47 (11)	< 0.001	50 (12)	49 (12)	0.14
Sex of household head (dummy, male=1)	1,681 (93%)	1,004 (95%)	0.047	1,629 (92%)	1,056 (96%)	< 0.001	1,546 (93%)	1,139 (95%)	0.007
Education level (Number of years)	2.5 (3.8)	3.4 (4.4)	< 0.001	2.4 (3.8)	3.6 (4.4)	< 0.001	2.1 (3.3)	3.9 (4.8)	< 0.001
Household size (number of persons)	12 (7)	10 (6)	< 0.001	12 (7)	10 (6)	< 0.001	13 (10)	10 (7)	< 0.001
Dependency ratio	1.59 (1.10)	1.77 (1.38)	0.029	1.64 (1.15)	1.69 (1.30)	0.8	1.74 (1.32)	1.95 (1.63)	0.015
Farmers group membership (dummy)	757 (42%)	551 (52%)	< 0.001	771 (44%)	537 (49%)	0.005	696 (42%)	518 (43%)	0.4
Training on agriculture (dummy)	591 (33%)	473 (45%)	< 0.001	557 (31%)	507 (46%)	< 0.001	530 (32%)	565 (47%)	< 0.001
Training on groundnut farming(dummy)	1,020 (56%)	587 (55%)	0.6	1,001 (57%)	606 (55%)	0.5	629 (38%)	766 (64%)	< 0.001
Public agricultural extension service (number of visits)	1.21 (1.66)	3.32 (3.30)	< 0.001	1.40 (1.84)	2.94 (3.29)	< 0.001	1.71 (1.90)	2.47 (2.12)	< 0.001
Private agricultural extension service (number of visits)	0.58 (0.90)	1.54 (1.89)	< 0.001	0.62 (0.94)	1.44 (1.88)	< 0.001	1.11 (1.33)	1.38 (1.57)	< 0.001
Cash credit for groundnut farming (dummy)	32 (1.8%)	24 (2.3%)	0.4	30 (1.7%)	26 (2.4%)	0.2	49 (2.9%)	76 (6.3%)	< 0.001
Credit in kind for groundnut farming (dummy)	62 (3.4%)	129 (12%)	< 0.001	54 (3.1%)	137 (12%)	< 0.001	87 (5.2%)	150 (13%)	< 0.001
Distance to the nearest urban market (km)	15 (18)	11 (11)	< 0.001	15 (19)	11 (11)	< 0.001	13 (14)	12 (14)	< 0.001
Distance the nearest village market (km)	3.8 (5.3)	3.5 (3.7)	0.004	3.9 (5.4)	3.4 (3.6)	0.003	4.8 (5.0)	3.6 (4.5)	< 0.001
Crop rotation (dummy)	889 (49%)	397 (37%)	< 0.001	905 (51%)	381 (35%)	< 0.001	921 (55%)	393 (33%)	< 0.001
Mixed Crops (dummy)	657 (36%)	448 (42%)	0.001	681 (38%)	424 (39%)	>0.9	725 (43%)	542 (45%)	0.3
Labor force (man.day)	3.9 (5.1)	6.5 (7.4)	< 0.001	4.4 (5.5)	5.6 (7.1)	< 0.001	7 (9)	7 (6)	< 0.001
Unit selling price (USD/kg)	0.53 (0.07)	0.71 (0.08)	< 0.001	0.53 (0.07)	0.72 (0.08)	< 0.001	0.53 (0.07)	0.71 (0.09)	< 0.001
Seed cost (USD/ha)	8 (16)	27 (19)	< 0.001	8 (17)	25 (20)	< 0.001	20 (21)	23 (19)	< 0.001
Fertilizer cost (USD/ha)	17 (29)	53 (39)	< 0.001	18 (30)	49 (40)	< 0.001	19 (28)	49 (39)	< 0.001
Pesticide cost (USD/ha)	4 (8)	14 (14)	< 0.001	4 (8)	13 (14)	< 0.001	6 (13)	11 (11)	< 0.001
Labor cost (USD/ha)	21 (33)	49 (41)	< 0.001	24 (34)	43 (41)	< 0.001	50 (49)	50 (41)	0.031
Groundnut area (ha)	1.44 (1.47)	1.81 (1.62)	< 0.001	1.49 (1.46)	1.72 (1.64)	< 0.001	1.60 (1.47)	1.72 (1.32)	< 0.001
Off-farm income (dummy)	80 (4.4%)	190 (18%)	< 0.001	85 (4.8%)	185 (17%)	< 0.001	142 (8.5%)	199 (17%)	< 0.001
Clay soil (dummy)	279 (15%)	164 (15%)	>0.9	271 (15%)	172 (16%)	0.8	282 (17%)	207 (17%)	0.8
Sandy-clay soil (dummy)	987 (55%)	595 (56%)	0.4	977 (55%)	605 (55%)	>0.9	740 (44%)	516 (43%)	0.5
Silty soil (dummy)	281 (16%)	162 (15%)	0.9	278 (16%)	165 (15%)	0.6	306 (18%)	200 (17%)	0.3

<sup>1</sup> n (%); Mean (SD)
2 Pearson's Chi-squared test; Wilcoxon rank sum test

# 3 Pooled OLS Regressions

Table SM2: Full OLS estimates of the relationship between adoption and commercialization (Adoption)  $\,$ 

variables	Sellers	Quantity sold	Sales value
Adoption dummy	0.021*	0.145*	0.132*
	(0.012)	(0.079)	(0.073)
Age of household head (years)	-0.001**	-0.006**	-0.005***
	(0.000)	(0.002)	(0.002)
Sex of household head (dummy, male=1)	-0.012	0.105	0.112
	(0.020)	(0.129)	(0.118)
Education level (Number of years)	0.001	-0.005	-0.005
(	(0.001)	(0.006)	(0.005)
Household size (number of persons)	0.000	0.015***	0.015***
1	(0.001)	(0.005)	(0.004)
Farmers group membership (dummy)	0.022***	0.132***	0.120***
rannors group membersing (daminy)	(0.004)	(0.029)	(0.027)
Training on agriculture (dummy)	-0.057***	-0.320***	-0.282***
Training on agriculture (duminy)	(0.011)	(0.074)	(0.068)
Training on groundnut farming (dummy)	-0.021***	-0.154***	-0.143***
Training on grounding rarining (duminy)	-0.021	-0.104	-0.140
	(0.004)	(0.025)	(0.023)
Public agricultural extension service (number of visits)	0.001	-0.017	-0.018
	(0.002)	(0.014)	(0.013)
Private agricultural extension service (number of visits)	0.007**	0.034*	0.027
	(0.003)	(0.020)	(0.019)
Cash credit for groundnut farming (dummy)	0.011	0.034	0.026
	(0.020)	(0.140)	(0.130)
Credit in kind for groundnut farming (dummy)	-0.008	0.039	0.043
order in kind for grounding farming (duminy)	(0.012)	(0.088)	(0.082)
Distance to the nearest urban market (km)	-0.002***	-0.015***	-0.014***
· /	(0,000)	(0.000)	(0.000)
Distance the second (11, second (1, sec)	(0.000) -0.004***	(0.002) -0.021***	(0.002) -0.019***
Distance the nearest village market (km)			
C	(0.001)	(0.007)	(0.007)
Crop rotation (dummy)	0.010 $(0.010)$	0.085 $(0.063)$	0.078 $(0.057)$
	, ,	` '	·
Mixed Crops (dummy)	0.003	-0.095*	-0.097**
T	(0.008)	(0.051)	(0.047)
Labor force (man.day)	0.002***	0.024***	0.023***
	(0.001)	(0.004)	(0.004)
Unit selling price (USD/kg)	0.068	0.579**	2.001***
	(0.042)	(0.286)	(0.264)
Seed cost (USD/ha)	0.001***	0.010***	0.009***
	(0.000)	(0.002)	(0.002)
Fertilizer cost (USD/ha)	0.000	0.001*	0.001*
	(0.000)	(0.001)	(0.001)
Pesticide cost (USD/ha)	-0.000	0.003	0.003
r esticide cost (cosz/na)	(0.000)	(0.002)	(0.002)
Labor cost (USD/ha)	0.000***	0.002***	0.002***
Labor cost (CDD/IIa)	(0.000)	(0.001)	(0.001)
Groundnut area (ha)	0.019***	0.347***	0.335***
Groundhut area (na)			0.555
0.774	(0.003)	(0.022)	(0.021)
Off-farm income (dummy)	-0.033***	-0.151**	-0.135**
	(0.010)	(0.074)	(0.069)
Dependency ratio	0.001	-0.002	-0.003
	(0.003)	(0.019)	(0.017)
Clay soil (dummy)	-0.008	-0.097	-0.095
• • • • • • • • • • • • • • • • • • • •	(0.011)	(0.077)	(0.071)
Sandy-clay soil (dummy)	0.007	0.035	0.031
	(0.009)	(0.061)	(0.056)
Silty soil (dummy)	0.008	0.052	0.046
-			
	(0.011)	(0.076)	(0.070)

Table SM2: Full OLS estimates of the relationship between adoption and commercialization (Adoption) (continued)

variables	Sellers	Quantity sold	Sales value
Constant	0.852*** (0.038)	5.469*** (0.258)	4.157*** (0.236)
Observations	8,604	8,604	8,604
R-squared	0.274	0.421	0.451
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table SM3: Full OLS estimates of the relationship between adoption and commercialization (Area under Adoption)

variables	Sellers	Quantity sold	Sales value
Area under adoption (ha)	-0.006	-0.021	-0.015
- , ,	(0.004)	(0.032)	(0.031)
Age of household head (years)	-0.001**	-0.006**	-0.005***
(3	(0.000)	(0.002)	(0.002)
Sex of household head (dummy, male=1)	-0.011	0.110	0.116
	(0.020)	(0.129)	(0.118)
Education level (Number of years)	0.001	-0.005	-0.006
	(0.001)	(0.006)	(0.005)
Household size (number of persons)	0.000	0.014***	0.014***
, ,	(0.001)	(0.005)	(0.004)
Farmers group membership (dummy)	0.022***	0.132***	0.120***
	(0.004)	(0.029)	(0.027)
Training on agriculture (dummy)	-0.056***	-0.319***	-0.282***
	(0.011)	(0.074)	(0.068)
Training on groundnut farming (dummy)	-0.021***	-0.155***	-0.144***
	(0.004)	(0.025)	(0.023)
Public agricultural extension service (number of visits)	0.001	-0.015	-0.016
,	(0.002)	(0.014)	(0.013)
Private agricultural extension service (number of visits)	0.008***	0.042**	0.033*
Tivate agricultural extension service (number of visits)	(0.003)	(0.020)	(0.019)
Cash credit for groundnut farming (dummy)	0.011	0.038	0.030
cash create for grounding tarining (duminy)	(0.020)	(0.140)	
Condit in hind for annual double formains (decomposity)		, ,	(0.131)
Credit in kind for groundnut farming (dummy)	-0.006	0.052	0.053
Distance to the nearest urban market (km)	(0.012) -0.002***	(0.087) -0.015***	(0.082) -0.014***
,	(0.000)	(0,002)	
Distance the nearest village market (km)	-0.004***	(0.002) -0.021***	(0.002) -0.019***
Distance the hearest vinage market (km)	(0.001)	(0.007)	(0.007)
Crop rotation (dummy)	0.001)	0.080	0.074
Crop rotation (dumniy)	(0.010)	(0.063)	(0.058)
Mixed Crops (dummy)	0.002	-0.100*	-0.102**
minod crops (ddiminy)	(0.008)	(0.051)	(0.047)
Labor force (man.day)	0.002***	0.023***	0.022***
Labor force (man.day)			
Unit selling price (USD/kg)	(0.001) $0.134***$	(0.004) 0.982***	(0.004) $2.357***$
31 (14 / 3)	(0.024)		
Cood and (ICD/ha)	(0.034) 0.001***	(0.235) 0.010***	(0.218) 0.009***
Seed cost (USD/ha)			
E (II (III)	(0.000)	(0.002)	(0.002)
Fertilizer cost (USD/ha)	0.000	0.002**	0.002**
	(0.000)	(0.001)	(0.001)
Pesticide cost (USD/ha)	-0.000	0.004	0.004*
	(0.000)	(0.002)	(0.002)
Labor cost (USD/ha)	0.000***	0.002***	0.002***
	(0.000)	(0.001)	(0.001)
Groundnut area (ha)	0.022***	0.355***	0.342***
	(0.003)	(0.022)	(0.021)
Off-farm income (dummy)	-0.033***	-0.150**	-0.134*
( ),	(0.010)	(0.074)	(0.069)
Dependency ratio	0.001	-0.003	-0.003
Dependency ravie	(0.003)	(0.019)	(0.017)
Clay soil (dummy)	-0.009	-0.101	-0.099
olay bon (daminy)	(0.011)	(0.077)	(0.071)
Sandy-clay soil (dummy)	0.006	0.032	0.028
bandy-clay son (duminy)		(0.060)	
Silty soil (dummy)	(0.009) $0.008$	0.053	(0.055) $0.046$
()			
	(0.011)	(0.076)	(0.070)
Constant	0.819***	5.267***	3.980***
	(0 000)		
Observations	(0.036) $8,604$	(0.245) $8,604$	(0.225) $8,604$

Table SM3: Full OLS estimates of the relationship between adoption and commercialization (Area under Adoption) (continued)

variables	Sellers	Quantity sold	Sales value
R-squared	0.273	0.421	0.451
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

Table SM4: Full OLS estimates of the relationship between adoption, production and yields (Adoption)  $\,$ 

Sex of household head (dummy, male=1) -17  Education level (Number of years) (2.1  Household size (number of persons) (2.2  Household size (number of persons) (1.1  Farmers group membership (dummy) 27.  Training on agriculture (dummy) (28.  Training on groundnut farming (dummy) -2.  Public agricultural extension service (number of visits) -10  Private agricultural extension service (number of visits) -20.0  Cash credit for groundnut farming (dummy) -116.  Credit in kind for groundnut farming (dummy) 19  Distance to the nearest urban market (km) (0.1  Distance the nearest village market (km) -3.  (in)  Crop rotation (dummy) -54.  (in)  Crop rotation (dummy) -64.  Unit selling price (USD/kg) 36.  Seed cost (USD/ha) -1.34  Fertilizer cost (USD/ha) -1.34  Labor cost (USD/ha) -1.34  Labor cost (USD/ha) -2.  Labor cost (USD/ha) -2.  Labor cost (USD/ha) -2.  Labor cost (USD/ha) -2.	536)       (24.099)         .226       0.246         .882)       (0.625)         .450       -20.938         .798)       (23.338)         .573       -0.462         .929)       (2.113)         .087       -3.346**         .918)       (1.312)         .603*       23.696**         .436)       (10.143)         .058       10.166         .123)       (19.713)         .803       -3.008         .558)       (6.533)         .965       -9.267*         .583)       (5.383)         .55**       -13.667**         .408)       (6.454)         .683*       -96.283**         .411)       (42.370)         .798       39.725	(15.075) 6
Age of household head (years) (0.  Sex of household head (dummy, male=1) (31.  Education level (Number of years) (2.  Household size (number of persons) (1.  Farmers group membership (dummy) (2.  Training on agriculture (dummy) (2.  Training on groundnut farming (dummy) (9.  Public agricultural extension service (number of visits) (7.  Private agricultural extension service (number of visits) (9.  Cash credit for groundnut farming (dummy) 116.  (62.  Credit in kind for groundnut farming (dummy) 116.  Credit in kind for groundnut farming (dummy) 15.  Distance to the nearest urban market (km) (0.  Distance the nearest village market (km) (3.  Crop rotation (dummy) 40.  Unit selling price (USD/kg) 36.  Seed cost (USD/ha) (2.  Labor cost (USD/ha) 1.  Labor cost (USD/ha) 2.  Labor cost (USD/ha) 2.  Labor cost (USD/ha) 3.	536)       (24.099)         .226       0.246         .882)       (0.625)         .450       -20.938         .798)       (23.338)         .573       -0.462         .299)       (2.113)         .087       -3.346**         .918)       (1.312)         .603*       23.696**         .123)       (19.713)         .803       -3.008         .558)       (6.533)         .9965       -9.267*         .683)       (5.383)         .55**       -13.667**         .408)       (6.454)         .683*       -96.283**         .4111)       (42.370)         .798       39.725         .308)       (37.817)	(15.075) 6
Age of household head (years) (0.5 cx of household head (dummy, male=1) -17 (3.1 ct. 17 (2.2 ct. 18	.226         0.246           .882)         (0.625)           .450         -20.938           .798)         (23.338)           .573         -0.462           .929)         (2.113)           .087         -3.346**           .918)         (1.312)           .603*         23.696**           .436)         (10.143)           .058         10.166           .123)         (19.713)           .803         -3.008           .558)         (6.533)           .965         -9.267*           .583)         (5.383)           .95**         -13.667**           .408)         (6.454)           .683*         -96.283**           .411)         (42.370)           .798         39.725           .308)         (37.817)	6
Sex of household head (dummy, male=1)	882)       (0.625)         .450       -20.938         798)       (23.338)         .573       -0.462         .229)       (2.113)         .087       -3.346**         .918)       (1.312)         .603*       23.696**         .436)       (10.143)         .058       10.166         .123)       (19.713)         .803       -3.008         .558)       (6.533)         .965       -9.267*         .583)       (5.383)         .13.667**       (408)         .6454)       (6.454)         .683*       -96.283**         .411)       (42.370)         .798       39.725         .308)       (37.817)	(0.374) (0.374) (0.374) (0.374) (0.4355) (17.706) (1.681) (1.329) (0.531) (0.633) (0.633) (1.717) (5.305) (12.945) (11.464) (32.129) (4.027) (4.027) (4.027) (4.027) (4.027) (5.305) (3.826) (6.3990) (6.7589) (7.589) (7.589) (19.779) (19.779) (19.779) (19.779)
Sex of household head (dummy, male=1)  Education level (Number of years)  (2)  Household size (number of persons)  (2)  Farmers group membership (dummy)  (28)  Training on agriculture (dummy)  (28)  Training on groundnut farming (dummy)  (29)  Public agricultural extension service (number of visits)  (7)  Private agricultural extension service (number of visits)  (6)  Cash credit for groundnut farming (dummy)  (62)  Cash credit for groundnut farming (dummy)  (16)  Distance to the nearest urban market (km)  (10)  Distance the nearest village market (km)  (21)  Mixed Crops (dummy)  (21)  Labor force (man.day)  (22)  Unit selling price (USD/kg)  Seed cost (USD/ha)  (128)  Seed cost (USD/ha)  (24)  Cabor cost (USD/ha)  (31)  (31)  (31)  (31)  (31)  (42)  (43)  (44)  (45)  (46)  (47)  (47)  (48)  (49)  (49)  (40)  (	.450	3 -24.355 ) (17.706) 2 1.681 ) (1.329) \$ 0.531 ) (0.633) \$ 1.717 ) (5.305) 6 12.945 ) (11.464) 8 -2.129 ) (4.027) \$ -7.113** ) (2.889) \$ -3.053 ) (3.826) \$ -3.990 ) (27.589) -8.167 ) (19.779) 0 0.039
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Household size (number of persons)	929)         (2.113)           .087         -3.346**           .918)         (1.312)           .603*         23.696**           .436)         (10.143)           .058         10.166           .123)         (19.713)           .803         -3.008           .558)         (6.533)           .965         -9.267*           .583)         (5.383)           .95**         -13.667**           .408)         (6.454)           .683*         -96.283**           .411)         (42.370)           .798         39.725           .308)         (37.817)	(1.329) (0.633) (0.633) (1.717) (5.305) (11.464)
Household size (number of persons)	.087 -3.346** .018) (1.312) .038* 23.696** .039* (10.143) .058 10.166 .123) (19.713) .803 -3.008 .558) (6.533) .965 -9.267* .583) (5.383) .55** -13.667** .0408) (6.454) .683* -96.283** .0598 39.725 .0598 39.725 .0598 39.725 .0598 39.725 .0598 39.725 .0598 39.725 .0598 39.725	(0.531 (0.633) (0.633) (1.717 (5.305) (11.945) (11.464) (3 -2.129) (4.027) (4.027) (7.113** (2.889) (3.826) (3.826) (4.027) (4
Farmers group membership (dummy)  27.  (14.  Training on agriculture (dummy)  28.  Training on groundnut farming (dummy)  29.  Public agricultural extension service (number of visits)  Private agricultural extension service (number of visits)  Cash credit for groundnut farming (dummy)  Credit in kind for groundnut farming (dummy)  Distance to the nearest urban market (km)  Crop rotation (dummy)  (10.  Crop rotation (dummy)  Crop rotation (dummy)  (21.  Abor force (man.day)  (22.  Credit in selling price (USD/kg)  (128.  Seed cost (USD/ha)  (0.  Pesticide cost (USD/ha)  (1.  Labor cost (USD/ha)  (1.  Labor cost (USD/ha)	918)     (1.312)       603*     23.696***       136)     (10.143)       .058     10.166       123)     (19.713)       .803     -3.008       558)     (6.533)       .965     -9.267*       583)     (5.383)       .95**     -13.667**       408)     (6.454)       583*     -96.283**       411)     (42.370)       .798     39.725       308)     (37.817)	(0.633) (1.717) (5.305) (12.945) (11.464) (11.464) (1.4027) (1.402
Farmers group membership (dummy)  (14. Training on agriculture (dummy)  (28. Training on groundnut farming (dummy)  (29. Public agricultural extension service (number of visits)  (7) Private agricultural extension service (number of visits)  (9) Cash credit for groundnut farming (dummy)  (16) Credit in kind for groundnut farming (dummy)  (19) Cash credit for groundnut farming (dummy)  (10) Distance to the nearest urban market (km)  (11) Crop rotation (dummy)  (21) Mixed Crops (dummy)  (21) Labor force (man.day)  (22) Unit selling price (USD/kg)  Seed cost (USD/ha)  (128) Seed cost (USD/ha)  (128) Cesticide cost (USD/ha)  (29)  (20) (20) (21) (21) (21) (22) (23) (24) (24) (25) (26) (26) (27) (27) (27) (27) (28) (29) (29) (20) (20) (21) (21) (21) (22) (23) (24) (25) (26) (27) (27) (27) (27) (28) (29) (29) (20) (21) (21) (21) (22) (23) (24) (25) (26) (27) (27) (27) (27) (28) (28) (29) (29) (20) (20) (21) (21) (21) (22) (23) (24) (25) (26) (26) (27) (27) (27) (27) (28) (28) (29) (20) (21) (21) (21) (22) (23) (24) (25) (26) (27) (27) (27) (27) (27) (28) (28) (28) (29) (20) (21) (21) (22) (23) (24) (25) (26) (26) (27) (27) (27) (27) (28) (28) (28) (29) (20) (20) (21) (21) (21) (22) (22) (23) (23) (24) (24) (25) (26) (26) (27) (27) (27) (27) (28) (28) (28) (28) (28) (28) (28) (28	503*     23.696**       436)     (10.143)       .058     10.166       123)     (19.713)       .803     -3.008       558)     (6.533)       .965     -9.267*       583)     (5.383)       .5**     -13.667**       408)     (6.454)       .683*     -96.283**       411)     (42.370)       .798     39.725       308)     (37.817)	1.717 (5.305) (5.305) (12.945) (11.464) (3.3 -2.129) (4.027) (7.113** (2.889) (3.826) (3.826) (27.589) (27.589) (19.779) (0.039)
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Private agricultural extension service (number of visits)         -20.0           (9)         (9)           Cash credit for groundnut farming (dummy)         -116.           (62)         (62)           Credit in kind for groundnut farming (dummy)         18           (52)         (52)           Distance to the nearest urban market (km)         -0           Distance the nearest village market (km)         -3.           (1)         -54.           (27)         (27)           Mixed Crops (dummy)         40.           (21)         (21)           Labor force (man.day)         -2           (22)         (21)           Unit selling price (USD/kg)         36           (128.         (22.           Seed cost (USD/ha)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34           (0)         -1.34	-13.667** (6.454) (6.454) (6.83* -96.283** (411) (42.370) (798 39.725 (308) (37.817)	-3.053 (3.826) -3.990 (27.589) -8.167 (19.779) 0.039
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Cash credit for groundnut farming (dummy) -116.  Credit in kind for groundnut farming (dummy) 19.  Credit in kind for groundnut farming (dummy) 19.  (52.  Distance to the nearest urban market (km) -0.  Distance the nearest village market (km) -3.  (1.  Crop rotation (dummy) -54.  (27.  Mixed Crops (dummy) 40.  (21.  Labor force (man.day) -4.  Unit selling price (USD/kg) 36.  Seed cost (USD/ha) -1.34  (0.  Pesticide cost (USD/ha) 2.  Labor cost (USD/ha) 2.  Labor cost (USD/ha) 6.  Capture of the nearest urban market (km) -1.34  (0.  Pesticide cost (USD/ha) 2.  Labor cost (USD/ha) 6.  Capture of the nearest urban market (km) -1.0  (a.  Crop rotation (dummy) -2.  (b.  Capture of the nearest urban market (km) -0.  (c.  Cost (USD/ha) -1.34  (d.  Capture of the nearest urban market (km) -0.  (a.  Capture of the nearest urban market (km) -0.  (b.  Capture of the nearest urban market (km) -0.  (c.  Cost (USD/ha) -1.34  (d.  Cost (USD/ha) -1.34  (d.  Cost (USD/ha) -1.34  (d.  Cost (USD/ha) -1.34	408)     (6.454)       583*     -96.283**       411)     (42.370)       798     39.725       308)     (37.817)	(3.826) 3.990 (27.589) 58.167 (19.779) 0.039
Credit in kind for groundnut farming (dummy)  15  (52)  Distance to the nearest urban market (km)  (0)  Distance the nearest village market (km)  (1)  Crop rotation (dummy)  (27)  Mixed Crops (dummy)  (21)  Labor force (man.day)  (22)  Unit selling price (USD/kg)  (128)  Seed cost (USD/ha)  (10)  Fertilizer cost (USD/ha)  (11)  Pesticide cost (USD/ha)  (12)  Labor cost (USD/ha)  (13)  (14)  (15)  (15)  (16)  (17)  (17)  (18)  (18)  (19)  (19)  (19)  (10)  (10)  (11)  (11)  (11)  (12)  (12)  (13)  (14)  (15)  (15)  (16)  (17)  (17)  (18)  (18)  (19)  (1	411)     (42.370)       .798     39.725       308)     (37.817)	) (27.589) 5 -8.167 ) (19.779) 0 0.039
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Distance to the nearest urban market (km)	308) (37.817)	(19.779) 0 0.039
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Crop rotation (dummy)       -54.         (27.         Mixed Crops (dummy)       40.         (21.         Labor force (man.day)       -4         Unit selling price (USD/kg)       36         Seed cost (USD/ha)       -0         Fertilizer cost (USD/ha)       -1.34         (0.       Pesticide cost (USD/ha)       2.         Labor cost (USD/ha)       2.         Labor cost (USD/ha)       0.	361* -2.097*	-1.617**
(27.  Mixed Crops (dummy)  40. (21.  Labor force (man.day)  (2.  Unit selling price (USD/kg)  36. (128.  Seed cost (USD/ha)  -0.  Fertilizer cost (USD/ha)  -1.34  (0.  Pesticide cost (USD/ha)  2.  Labor cost (USD/ha)	340) (1.198)	(0.795)
Mixed Crops (dummy) 40.  (21.  Labor force (man.day) -4  (2.  Unit selling price (USD/kg) 36  (128.  Seed cost (USD/ha) -0  Fertilizer cost (USD/ha) -1.34  (0.  Pesticide cost (USD/ha) 2.  Labor cost (USD/ha) 6.  Labor cost (USD/ha) 6.		
(21. Labor force (man.day)  (22. Unit selling price (USD/kg)  (128. Seed cost (USD/ha)  (0. Fertilizer cost (USD/ha)  (0. Pesticide cost (USD/ha)  (12. Augustian (USD/ha)  (12. Augustian (USD/ha)  (13. Augustian (USD/ha)  (14. Augustian (USD/ha)  (15. Augustian (USD/ha)  (16. Augustian (USD/ha)  (17. Augustian (USD/ha)  (18. Augustian (USD/ha)  (19. Augustian (USD/ha)		
Labor force (man.day)       -4         (2       (2         Unit selling price (USD/kg)       36         (128       (128         Seed cost (USD/ha)       -0         Fertilizer cost (USD/ha)       -1.34         (0       (0         Pesticide cost (USD/ha)       2         Labor cost (USD/ha)       (1         Labor cost (USD/ha)       (2	551* 32.475**	-1.605
Unit selling price (USD/kg)       (2.         Unit selling price (USD/kg)       (128.         Seed cost (USD/ha)       -0.         Fertilizer cost (USD/ha)       -1.34         (0.       Pesticide cost (USD/ha)       2.         Labor cost (USD/ha)       (1.         Labor cost (USD/ha)       (2.		
Unit selling price (USD/kg)       36         (128.         Seed cost (USD/ha)       -6         Fertilizer cost (USD/ha)       -1.34         (0.         Pesticide cost (USD/ha)       2.         (1.       Labor cost (USD/ha)	.390 -3.713**	-1.619**
(128. Seed cost (USD/ha) -( (0. Fertilizer cost (USD/ha) -1.34 (0. Pesticide cost (USD/ha) 2. (1. Labor cost (USD/ha) (1. (1. (1. (1. (1. (1. (1. (1. (1. (1.	721) (1.808)	(0.788)
Seed cost (USD/ha)       -6         (0.       (0.         Fertilizer cost (USD/ha)       -1.34         (0.       Pesticide cost (USD/ha)         2.       (1.         Labor cost (USD/ha)       (1.	.726 1,208.590***	* 93.809*
(0. Fertilizer cost (USD/ha) -1.34 (0. Pesticide cost (USD/ha) 2. (1. Labor cost (USD/ha) (1. Cabor co	, , ,	
Fertilizer cost (USD/ha)	.542 -0.338	
(0.  Pesticide cost (USD/ha)  2.  (1.  Labor cost (USD/ha)	(0.402)	
Pesticide cost (USD/ha)  2. (1. Labor cost (USD/ha)		-0.004
Labor cost (USD/ha) (1.	(0.322)	(0.199)
Labor cost (USD/ha)	260* 2.177**	0.024
	(0.999)	(0.531)
(0.	.075 0.043	-0.082
	(0.191)	(0.131)
Groundnut area (ha) 698.17		
(20.	072) (13.993)	(3.300)
Off-farm income (dummy) -15	.131 -9.056	-21.645
(39.	174) (29.191)	(18.076)
· ·	.922 -9.494*	
•		
Clay soil (dummy)	(5.439)	2 3.708
(29.	.092 (5.439) .092 0.292	(13.795)
· ·	.092 0.292	
	.092 0.292	
	.092 0.292 406) (20.300) .195 20.606	·
(30.	.092 0.292 406) (20.300) .195 20.606	
· ·	.092 0.292 406) (20.300) .195 20.606 .243) (17.693) .218 14.886	(13.986)
(100.	.092 0.292 406) (20.300) .195 20.606 .243) (17.693) .218 14.886	
Observations	.092 0.292 406) (20.300) .195 20.606 243) (17.693) .218 14.880 .870) (21.598) .343 -695.254***	* 605.495***

Table SM4: Full OLS estimates of the relationship between adoption, production and yields (Adoption) (continued)

variables	Production	Production value	Yields
R-squared	0.616	0.594	0.181
Robust standard errors in parentheses *** $p<0.01$ , ** $p<0.05$ , * $p<0.1$			

Table SM5: OLS estimates of the relationship between adoption, production and yields (Area under Adoption)  $\,$ 

Area under adoption (ha)  Age of household head (years)  Sex of household head (dummy, male=1)  Education level (Number of years)  Education level (Number of persons)  Household size (number of persons)  (2.916)  Household size (number of persons)  Training on agriculture (dummy)  Training on agriculture (dummy)  Training on groundnut farming (dummy)  Training on groundnut farming (dummy)  Public agricultural extension service (number of visits)  Private agricultural extension service (number of visits)  Cash credit for groundnut farming (dummy)  Credit in kind for groundnut farming (dummy)  Sesed  Distance to the nearest urban market (km)  Distance to the nearest village market (km)  Crop rotation (dummy)  Assert  Crop rotation (dummy)  Assert  Assert  (1.886)  Mixed Crops (dummy)  Labor force (man.day)  Labor force (man.day)  Labor force (man.day)  Seed cost (USD/ha)  Pesticide cost (USD/ha)  Pesticide cost (USD/ha)  Cayony  Groundnut area (ha)  Off-farm income (dummy)  Clay soil (dummy)  Clay soil (dummy)  Assert  Clay soil (dummy)  28.503  Cog. 29.032  Sandy-clay soil (dummy)  28.503  Cog. 29.032  Sandy-clay soil (dummy)  28.503  Cog. 29.032  Sandy-clay soil (dummy)  Assert  Cay soil (dummy)  Assert  Cayonya  Groundout area (ha)  Cayonya  Sandy-clay soil (dummy)  Assert  Cayonya	Production value	Yields
Age of household head (years)       0.377 (0.875)         Sex of household head (dummy, male=1)       -17.307 (0.875)         Education level (Number of years)       2.728 (2.916)         Household size (number of persons)       (1.852)         Farmers group membership (dummy)       23.024 (14.530)         Training on agriculture (dummy)       19.017 (28.199)         Training on groundnut farming (dummy)       -6.488 (7.401)         Public agricultural extension service (number of visits)       -10.123 (9.116)         Public agricultural extension service (number of visits)       -10.123 (9.116)         Cash credit for groundnut farming (dummy)       -8.89 (50.662)         Distance tin kind for groundnut farming (dummy)       -8.89 (50.662)         Distance to the nearest urban market (km)       -3.326 (63.173)         Distance the nearest village market (km)       -3.326 (1.806)         Crop rotation (dummy)       34.291 (21.331)         Labor force (man.day)       4.088 (2.997)         Unit selling price (USD/kg)       512.088***         Seed cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       (0.546)         Groundnut area (ha)       634.558***         <	216.814***	57.226***
Age of household head (years)       0.377 (0.875)         Sex of household head (dummy, male=1)       -17.307 (0.875)         Education level (Number of years)       2.728 (2.9621)         Household size (number of persons)       (0.104 (1.852)         Farmers group membership (dummy)       23.024 (14.530)         Training on agriculture (dummy)       19.017 (28.199)         Training on groundnut farming (dummy)       -6.488 (7.401)         Public agricultural extension service (number of visits)       -10.123 (9.116)         Public agricultural extension service (number of visits)       -10.123 (9.116)         Cash credit for groundnut farming (dummy)       -8.897 (50.662)         Distance the for groundnut farming (dummy)       -8.897 (50.662)         Distance to the nearest urban market (km)       -3.326 (1.806)         Distance the nearest village market (km)       -3.326 (1.806)         Crop rotation (dummy)       34.291 (21.331)         Labor force (man.day)       4.084 (1.806)         Vunit selling price (USD/kg)       512.083***         Seed cost (USD/ha)       (1.33.797)         Seed cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       (0.546)         Groundnut area (ha)       634.558***	(24.253)	(6.403)
Sex of household head (dummy, male=1)	,	0.025
Sex of household head (dummy, male=1)         -17.30           Education level (Number of years)         (29.621)           Education level (Number of years)         (2.916)           (2.916)         (2.916)           (1.852)         (1.852)           Farmers group membership (dummy)         23.024           Training on agriculture (dummy)         19.017           (28.199)         (28.199)           Training on groundnut farming (dummy)         -6.485           Public agricultural extension service (number of visits)         -5.811           (7.401)         (7.401)           Private agricultural extension service (number of visits)         -5.811           (9.166)         (9.166)           Cash credit for groundnut farming (dummy)         -8.735           (63.173)         (63.173)           Credit in kind for groundnut farming (dummy)         -8.879           (50.662)         Distance to the nearest urban market (km)         -0.735           Distance the nearest village market (km)         -0.326           (1.806)         (1.806)           Crop rotation (dummy)         -42.921           (26.883)         (1.306)           Mixed Crops (dummy)         34.299           Unit selling price (USD/kg)         512.083**** <td></td> <td>(0.380)</td>		(0.380)
Education level (Number of years)         2.728           (2.916)         (2.916)           Household size (number of persons)         0.104           Farmers group membership (dummy)         23.024           (14.530)         (14.530)           Training on agriculture (dummy)         19.017           Training on groundnut farming (dummy)         -6.485           Public agricultural extension service (number of visits)         -5.811           (7.401)         (7.401)           Private agricultural extension service (number of visits)         -10.123           (9.16)         (9.16)           Cash credit for groundnut farming (dummy)         -87.35           (63.173)         (63.173)           Credit in kind for groundnut farming (dummy)         -8.897           (50.662)         (50.662)           Distance to the nearest urban market (km)         -0.826           Distance the nearest village market (km)         -3.326*           (1.806)         (26.863)           Mixed Crops (dummy)         -4.2921           (26.863)         (21.331)           Labor force (man.day)         -4.084           (2.927)         (11.33.797)           Seed cost (USD/ha)         -0.125           (0.546)         (0.546)		-20.776
Household size (number of persons)		(17.751)
Household size (number of persons)		2.280*
(1.852)   Farmers group membership (dummy)   23.024 (14.530)   Training on agriculture (dummy)   19.017 (28.199)   Training on groundnut farming (dummy)   -6.485 (9.625)   Public agricultural extension service (number of visits)   -7.811 (7.401)   Private agricultural extension service (number of visits)   -7.811 (9.116)   Cash credit for groundnut farming (dummy)   -87.350 (63.173) (63.173)   Credit in kind for groundnut farming (dummy)   -8.897 (50.662)   Distance to the nearest urban market (km)   -0.735 (9.166)   Distance the nearest village market (km)   -3.326* (9.826)   Distance the nearest village market (km)   -3.326* (9.826)   Mixed Crops (dummy)   -42.921 (26.863) (13.807) (21.331) (21.331) (21.331) (21.331) (21.331) (21.331) (20.83*** (9.927) (9.546) (9.546) (9.431) (9.546) (9.431) (9.546) (9.431) (9.546) (9.431) (9.546) (9.431) (9.546) (9.431) (9.556) (9.325) (9.932)	, ,	(1.354)
Farmers group membership (dummy)  (23.024 (14.530) (14.530) (14.530) (19.017 (28.199) (28.199) (28.199) (9.625		1.023 (0.641)
Training on agriculture (dummy)       19.017 (28.199)         (28.199)       (28.199)         Public agricultural extension service (number of visits)       -6.485 (7.401)         Private agricultural extension service (number of visits)       -10.123 (9.116)         Cash credit for groundnut farming (dummy)       -87.350 (63.173)         Credit in kind for groundnut farming (dummy)       -8.897 (50.662)         Distance to the nearest urban market (km)       -0.735 (0.826)         Distance the nearest village market (km)       -3.326 (0.826)         Crop rotation (dummy)       -42.921 (26.863)         Mixed Crops (dummy)       34.291 (21.331)         Labor force (man.day)       -4.394 (2.927)         Unit selling price (USD/kg)       512.083***         Seed cost (USD/ha)       0.128 (0.546)         Fertilizer cost (USD/ha)       -0.846**         Fertilizer cost (USD/ha)       -0.846**         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.626         Obependency ratio       -7.874         Clay soil (dummy)       28.503 (29.032)         Sandy-clay soil (dummy)       45.222*	19.604*	0.668
Training on groundnut farming (dummy) -6.485  Public agricultural extension service (number of visits) -5.811 (7.401) Private agricultural extension service (number of visits) -10.123 (9.116) Cash credit for groundnut farming (dummy) -87.350 (63.173) Credit in kind for groundnut farming (dummy) -8.897 (50.662) Distance to the nearest urban market (km) -0.735  Distance the nearest village market (km) -3.326* (1.806) Crop rotation (dummy) -42.921 (26.863) Mixed Crops (dummy) -42.927 Unit selling price (USD/kg) -3.408 -3.408 Fertilizer cost (USD/ha) -0.126 Fertilizer cost (USD/ha) -0.846** -0.	(10.143)	(5.411)
Training on groundnut farming (dummy)       -6.485         (9.625)       (9.625)         Public agricultural extension service (number of visits)       -5.811         (7.401)       (7.401)         Private agricultural extension service (number of visits)       -10.123         (9.116)       (9.116)         (9.116)       (9.116)         (9.116)       (9.116)         (9.116)       (9.116)         (9.116)       (9.116)         (9.116)       (9.116)         (9.116)       (9.116)         (10.116)       (9.116)         (10.117)       (9.116)         (10.118)       (9.116)         (10.119)       (9.116)         (10.110)       (9.116)         (10.111)       (9.116)         (10.111)       (9.116)         (10.126)       (9.127)         (10.127)       (9.128)         (10.128)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)         (10.129)       (9.128)      <	8.794	13.199
Training on groundnut farming (dummy)  -6.485  (9.625)  Public agricultural extension service (number of visits)  -5.811 (7.401)  Private agricultural extension service (number of visits)  -10.123 (9.116) (	(19.422)	(11.653)
Public agricultural extension service (number of visits)	, ,	-4.435
(7.401)   Private agricultural extension service (number of visits)	, ,	(4.090)
Private agricultural extension service (number of visits)  (2.116) (2.116) (2.116) (2.116) (2.116) (2.116) (2.116) (2.116) (3.173) (3.186) (3.173) (3.186) (3.188) (3.	-6.431	-3.685
Cash credit for groundnut farming (dummy) -87.350 (63.173) Credit in kind for groundnut farming (dummy) -8.897 (50.662) Distance to the nearest urban market (km) -0.735  Distance the nearest village market (km) -0.735 (0.826) Distance the nearest village market (km) -0.735 (1.806) Crop rotation (dummy) -42.921 (26.863) Mixed Crops (dummy) -42.921 Labor force (man.day) -4.084 (2.927) Unit selling price (USD/kg) -12.083*** Seed cost (USD/ha) -0.126 Fertilizer cost (USD/ha) -0.846** -0.846** (0.431) Pesticide cost (USD/ha) -0.846** -0.846** (0.431) Clabor cost (USD/ha) -0.016 (0.257) Groundnut area (ha) -0.625 Groundnut area (ha) -3.625 (20.141) Clay soil (dummy) -3.625 (29.032) Sandy-clay soil (dummy) -45.222*	(5.123)	(2.924)
Cash credit for groundnut farming (dummy)  -87.35 (63.173) Credit in kind for groundnut farming (dummy)  -8.897 (50.662) Distance to the nearest urban market (km)  -0.735  (0.826) Distance the nearest village market (km)  -0.735 (1.806) Crop rotation (dummy)  -42.921 (26.863)  Mixed Crops (dummy)  (21.331) Labor force (man.day)  (21.331) Labor force (man.day)  (29.27) Unit selling price (USD/kg)  Seed cost (USD/ha)  (0.546) Fertilizer cost (USD/ha)  -0.846** (0.431) Pesticide cost (USD/ha)  Crop rotation (dummy)  -3.625 Groundnut area (ha)  (38.674) Clay soil (dummy)  28.503 (29.032) Sandy-clay soil (dummy)  45.222*	-10.434*	6.138
Credit in kind for groundnut farming (dummy) -8.897 (50.662) Distance to the nearest urban market (km) -0.735  Distance the nearest village market (km) -0.735  Crop rotation (dummy) -42.921 (26.863)  Mixed Crops (dummy) -42.921 (21.331) Labor force (man.day) -4.084 (2.927) Unit selling price (USD/kg) -4.084 Fertilizer cost (USD/ha) -0.846** -0.846** -0.846** (0.431) Pesticide cost (USD/ha) -0.846** Groundnut area (ha) -634.558***  (20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) -8.897 (50.662.7) (50.662.7) (50.826) (50.863.7) (50.862.7) (50.863.7)	(6.215)	(3.799)
Credit in kind for groundnut farming (dummy)       -8.897 (50.662) (50.662) (50.662)         Distance to the nearest urban market (km)       -0.735 (0.826)         Distance the nearest village market (km)       -3.3263 (1.806) (1.806)         Crop rotation (dummy)       -42.921 (26.863)         Mixed Crops (dummy)       34.291 (21.331) (21.331) (21.331)         Labor force (man.day)       -2.927         Unit selling price (USD/kg)       512.083***         Seed cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       -0.846**         Fertilizer cost (USD/ha)       (0.431)         Pesticide cost (USD/ha)       0.010 (0.257)         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625 (38.674)         Oppendency ratio       -7.874 (7.614)         Clay soil (dummy)       28.503 (29.032)         Sandy-clay soil (dummy)       45.222*	-74.251*	8.406
Credit in kind for groundnut farming (dummy)       -8.897 (50.662) (50.662) (50.662)         Distance to the nearest urban market (km)       -0.735 (0.826)         Distance the nearest village market (km)       -3.3263 (1.806) (1.806)         Crop rotation (dummy)       -42.921 (26.863)         Mixed Crops (dummy)       34.291 (21.331) (21.331) (21.331)         Labor force (man.day)       -2.927         Unit selling price (USD/kg)       512.083***         Seed cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       -0.846**         Pesticide cost (USD/ha)       (0.431)         Pesticide cost (USD/ha)       0.010 (0.257)         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625 (38.674)         Oppendency ratio       -7.874 (7.614)         Clay soil (dummy)       28.503 (29.032)         Sandy-clay soil (dummy)       45.222*	(42.902)	(28.328)
Distance to the nearest urban market (km)  (50.662)  Distance the nearest village market (km)  (0.826)  Distance the nearest village market (km)  (1.806)  Crop rotation (dummy)  (21.806)  Mixed Crops (dummy)  (21.331)  Labor force (man.day)  (21.331)  Labor force (man.day)  (2.927)  Unit selling price (USD/kg)  (133.797)  Seed cost (USD/ha)  (0.546)  Fertilizer cost (USD/ha)  (0.431)  Pesticide cost (USD/ha)  (0.431)  Pesticide cost (USD/ha)  (0.257)  Groundnut area (ha)  (33.674)  Off-farm income (dummy)  (20.141)  Off-farm income (dummy)  (38.674)  Clay soil (dummy)  28.503  (29.032)  Sandy-clay soil (dummy)  45.222*	, ,	-6.967
Distance to the nearest urban market (km)  -0.735  (0.826)  Distance the nearest village market (km)  -3.326*  (1.806)  Crop rotation (dummy)  -42.921 (26.863)  Mixed Crops (dummy)  (21.331)  Labor force (man.day)  -4.084 (2.927)  Unit selling price (USD/kg)  Seed cost (USD/ha)  -0.128 (0.546)  Fertilizer cost (USD/ha)  -0.846*  Pesticide cost (USD/ha)  -0.846*  Claysoil (dummy)  -3.625 (38.674)  Clay soil (dummy)  28.503 (29.032)  Sandy-clay soil (dummy)  -3.625 (29.032)  Sandy-clay soil (dummy)		(20.115)
Distance the nearest village market (km)  -3.326* (1.806) Crop rotation (dummy)  -42.921 (26.863) Mixed Crops (dummy)  34.291 (21.331) Labor force (man.day)  -4.084 (2.927) Unit selling price (USD/kg)  512.083***  (133.797) Seed cost (USD/ha)  -0.128 Fertilizer cost (USD/ha)  -0.846**  (0.431) Pesticide cost (USD/ha)  -0.846** (0.431)  Pesticide cost (USD/ha)  -0.168 (0.257) Groundnut area (ha)  -3.625 (38.674)  -7.874 (7.614)  Clay soil (dummy)  28.503 (29.032) Sandy-clay soil (dummy)  45.222*	, ,	-0.196
(1.806) Crop rotation (dummy)  (21.807) (26.863) Mixed Crops (dummy)  (21.331) Labor force (man.day) (2.927) Unit selling price (USD/kg)  (133.797) Seed cost (USD/ha) (0.546) Fertilizer cost (USD/ha) (0.546) Fertilizer cost (USD/ha)  (0.431) Pesticide cost (USD/ha) (1.325) Labor cost (USD/ha) (2.188* (0.257) Groundnut area (ha) (34.558***  (20.141) Off-farm income (dummy) (38.674) Dependency ratio (7.614) Clay soil (dummy) (29.032) Sandy-clay soil (dummy) (45.222*	(0.541)	(0.363)
Crop rotation (dummy)  -42.921 (26.863)  Mixed Crops (dummy)  Labor force (man.day)  -4.084 (2.927)  Unit selling price (USD/kg)  Seed cost (USD/ha)  Fertilizer cost (USD/ha)  Pesticide cost (USD/ha)  Clabor cost (USD/ha)  Clay soil (dummy)  Clay soil (dummy)  Sandy-clay soil (dummy)  45.222*	-2.099*	-1.568**
Mixed Crops (dummy)       34.291         (21.331)       (21.331)         Labor force (man.day)       -4.084         (2.927)       Unit selling price (USD/kg)       512.083***         Seed cost (USD/ha)       (0.546)         Fertilizer cost (USD/ha)       -0.846**         Fertilizer cost (USD/ha)       2.188*         Labor cost (USD/ha)       0.010         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625         Dependency ratio       -7.874         Clay soil (dummy)       28.503         (29.032)       Sandy-clay soil (dummy)         45.222*	(1.139)	(0.794)
Mixed Crops (dummy)  (21.331) (21.331) (21.331) (2.927) (2.927) (2.927) (2.927) (2.927) (2.927) (2.927) (2.927) (2.927) (2.927) (3.797) (3.797) (3.797) (3.646) (4.797) (4.797) (5.46) (5.46) (6.431) (6.431) (6.431) (6.431) (6.257) (6.257) (6.257) (7.614) (7.614) (7.614) (8.674) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032) (9.9.032)		0.911
Labor force (man.day)       (21.331)         -4.084       (2.927)         Unit selling price (USD/kg)       512.083***         (133.797)       (12.86)         Seed cost (USD/ha)       0.128         Fertilizer cost (USD/ha)       -0.846**         Pesticide cost (USD/ha)       (1.325)         Labor cost (USD/ha)       0.010         (0.257)       Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625         (38.674)       (7.614)         Clay soil (dummy)       28.503         (29.032)       Sandy-clay soil (dummy)       45.222*		(11.740)
Labor force (man.day) -4.084 (2.927) Unit selling price (USD/kg) 512.083***  (133.797) Seed cost (USD/ha) 0.128 (0.546) Fertilizer cost (USD/ha) -0.846** (0.431) Pesticide cost (USD/ha) 2.188* (1.325) Labor cost (USD/ha) 0.010 (0.257) Groundnut area (ha) 634.558***  (20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*		-7.613
Unit selling price (USD/kg) 512.083***  (133.797) Seed cost (USD/ha) 0.128 (0.546) Fertilizer cost (USD/ha) -0.846**  (0.431) Pesticide cost (USD/ha) 2.188* (1.325) Labor cost (USD/ha) 0.010 (0.257) Groundnut area (ha) 634.558***  Off-farm income (dummy) -3.625 (20.141) Oppendency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*	(14.868)	(9.562)
Unit selling price (USD/kg) 512.083***  (133.797) Seed cost (USD/ha) 0.128 (0.546) Fertilizer cost (USD/ha) -0.846** (0.431) Pesticide cost (USD/ha) 2.188* (1.325) Labor cost (USD/ha) 0.010 (0.257) Groundnut area (ha) 634.558***  (20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*	-3.021	-2.037**
Seed cost (USD/ha)  Seed cost (USD/ha)  Fertilizer cost (USD/ha)  Pesticide cost (USD/ha)  County (USD/ha)	(1.994)	(0.808)
Seed cost (USD/ha)       0.128         (0.546)       (0.546)         Fertilizer cost (USD/ha)       -0.846**         (0.431)       (0.431)         Pesticide cost (USD/ha)       (1.325)         Labor cost (USD/ha)       0.010         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625         (38.674)       -7.874         Dependency ratio       -7.874         Clay soil (dummy)       28.503         (29.032)       Sandy-clay soil (dummy)	1,339.478***	565.109***
Co. 546   Co.	, ,	(49.594)
Fertilizer cost (USD/ha)  -0.846** (0.431)  Pesticide cost (USD/ha)  Labor cost (USD/ha)  Groundnut area (ha)  Off-farm income (dummy)  Dependency ratio  Clay soil (dummy)  28.503 (29.032)  Sandy-clay soil (dummy)  -0.846** (0.431) (0.431		0.042
(0.431) Pesticide cost (USD/ha)  Labor cost (USD/ha)  Coundinut area (ha)  Off-farm income (dummy)  Dependency ratio  Clay soil (dummy)  Sandy-clay soil (dummy)  (0.431)  (1.325) (0.257) (0.257) (0.257) (20.141) (20.141) (20.141) (38.674) (38.674) (7.614) (20.32) (29.032) (29.032)		(0.259)
Pesticide cost (USD/ha)  2.188*  Labor cost (USD/ha)  Coundinut area (ha)  Off-farm income (dummy)  Dependency ratio  Clay soil (dummy)  28.503  (29.032)  Sandy-clay soil (dummy)  45.222*		0.288
(1.325) Labor cost (USD/ha) (0.257) Groundnut area (ha) (34.558***  (20.141) Off-farm income (dummy) (38.674) Dependency ratio (7.614) Clay soil (dummy) (29.032) Sandy-clay soil (dummy) (1.325) (0.101) (20.141) (20.141) (20.141) (38.674) (29.032) (29.032)	(0.312)	(0.201)
Labor cost (USD/ha)       0.010         Groundnut area (ha)       634.558***         Off-farm income (dummy)       -3.625         (38.674)       -7.874         Dependency ratio       -7.874         Clay soil (dummy)       28.503         (29.032)         Sandy-clay soil (dummy)       45.222*	1.732*	0.456
Groundnut area (ha) (0.257) Groundnut area (ha) 634.558***  (20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*	(1.024)	(0.540)
Groundnut area (ha) 634.558***  (20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*	-0.006	-0.110
(20.141) Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.2225		(0.133) -11.249***
Off-farm income (dummy) -3.625 (38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.2228		
(38.674) Dependency ratio -7.874 (7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*		(3.596)
Dependency ratio       -7.874         (7.614)       (7.614)         Clay soil (dummy)       28.503         (29.032)       (29.032)         Sandy-clay soil (dummy)       45.222*		-17.434
(7.614) Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*		(18.365)
Clay soil (dummy) 28.503 (29.032) Sandy-clay soil (dummy) 45.222*		-0.786
(29.032) Sandy-clay soil (dummy) 45.222*	(5.353)	(3.592)
Sandy-clay soil (dummy) 45.222*	3 22.644	6.733
	(19.653)	(14.049)
	36.851**	1.791
(24.917)		(11.460)
Silty soil (dummy) 26.747		15.403
(30.838)	(21.038)	(14.258)
Constant -246.760**	, , ,	384.428***
(102.298)		(40.954)
Observations 8,604	, ,	8,604

Table SM5: OLS estimates of the relationship between adoption, production and yields (Area under Adoption) (continued)

variables	Production	Production value	Yields
R-squared	0.622	0.613	0.156
Robust standard errors in parentheses *** $p<0.01$ , ** $p<0.05$ , * $p<0.1$			

# 4 Panel Regression

Table SM6: Full 2SLS estimates of the relationship between adoption and commercialization (Adoption)  $\,$ 

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Adoption dummy	0.044**	0.033**	0.400***	0.354***	0.388***	0.346***
•	(0.017)	(0.015)	(0.117)	(0.105)	(0.108)	(0.097)
Age of household head (years)	0.002	-0.001*	-0.009	-0.006**	-0.011	-0.005**
	(0.003)	(0.000)	(0.024)	(0.003)	(0.022)	(0.003)
Sex of household head (dummy, male=1)		-0.011		0.121		0.127
		(0.020)		(0.137)		(0.126)
Education level (Number of years)		0.001		-0.005		-0.005
		(0.001)		(0.009)		(0.008)
Household size (number of persons)	0.002***	0.001*	0.027***	0.020***	0.026***	0.019***
	(0.001)	(0.001)	(0.005)	(0.004)	(0.004)	(0.004)
Farmers group membership (dummy)	0.022***	0.023***	0.126***	0.133***	0.113***	0.120***
	(0.005)	(0.004)	(0.035)	(0.028)	(0.032)	(0.026)
Training on agriculture (dummy)	-0.043***	-0.052***	-0.310***	-0.317***	-0.284***	-0.283***
- · · · · · · · · · · · · · · · · · · ·	(0.011)	(0.009)	(0.078)	(0.064)	(0.072)	(0.059)
Training on groundnut farming (dummy)	-0.025***	-0.023***	-0.178***	-0.168***	-0.164***	-0.155***
	(0.003)	(0.003)	(0.023)	(0.021)	(0.021)	(0.019)
Public agricultural extension service (number of visits)	0.002	0.002	-0.022	-0.017	-0.023	-0.019
and the second s	(0.002)	(0.002)	(0.016)	(0.014)	(0.015)	(0.013)
Private agricultural extension service (number of visits)	0.004	0.005*	0.051**	0.034*	0.048**	0.028
( ( )	(0.003)	(0.003)	(0.024)	(0.020)	(0.022)	(0.018)
	0.000	` /	, ,	,	, ,	` ′
Cash credit for groundnut farming (dummy)	-0.009	0.001	-0.174	-0.068	-0.181	-0.075
	(0.023)	(0.020)	(0.156)	(0.136)	(0.144)	(0.125)
Credit in kind for groundnut farming (dummy)	-0.043***	-0.025*	-0.035	-0.009	-0.011	0.004
25-4	(0.016)	(0.014)	(0.109)	(0.093)	(0.100)	(0.086)
Distance to the nearest urban market (km)	-0.000	-0.001***	-0.003*	-0.009***	-0.003*	-0.008***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)
Distance the nearest village market (km)	-0.003***	-0.003***	-0.012*	-0.016***	-0.011*	-0.015***
	(0.001)	(0.001)	(0.006)	(0.005)	(0.006)	(0.005)
Crop rotation (dummy)	-0.025**	-0.006	-0.158**	-0.024	-0.147**	-0.022
	(0.011)	(0.009)	(0.072)	(0.061)	(0.066)	(0.056)
Mixed Crops (dummy)	0.004	0.002	-0.065	-0.083*	-0.067	-0.085*
1 ( 0 /	(0.009)	(0.007)	(0.061)	(0.050)	(0.056)	(0.046)
abor force (man.day)	0.002***	0.002***	0.026***	0.025***	0.025***	0.024***
` '	(0.001)	(0.001)	(0.005)	(0.004)	(0.004)	(0.004)
Unit selling price (USD/kg)	0.051	0.058	0.275	0.243	1.687***	1.648***
	(0.050)	(0.046)	(0.338)	(0.313)	(0.311)	(0.288)
Seed cost (USD/ha)	0.002***	0.002***	0.011***	0.010***	0.010***	0.009***
ced cost (CSD/Ha)	(0.000)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)
Fertilizer cost (USD/ha)	0.000	0.000	0.001	0.002*	0.001	0.001
eremzer east (eszyna)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
O (CIGD /I )	, ,	, ,	, ,	,	, ,	` ′
Pesticide cost (USD/ha)	-0.001***	-0.001**	-0.004	-0.001	-0.003	-0.000
(Hap /I )	(0.000)	(0.000)	(0.003)	(0.003)	(0.003)	(0.002) 0.002***
Labor cost (USD/ha)	0.000***	0.000***	0.002***	0.002***	0.002***	0.00=
Z	(0.000)	(0.000) 0.013***	(0.001) 0.200***	(0.001) 0.285***	(0.001) 0.197***	(0.001) 0.277***
Groundnut area (ha)	0.003	0.015	0.200	0.285	0.197	0.211
	(0.003)	(0.003)	(0.023)	(0.018)	(0.021)	(0.017)
Off-farm income (dummy)	-0.019	-0.027**	-0.033	-0.099	-0.022	-0.086
	(0.014)	(0.012)	(0.098)	(0.083)	(0.090)	(0.076)
Dependency ratio	0.002	0.001	0.012	0.003	0.011	0.002
	(0.003)	(0.003)	(0.022)	(0.018)	(0.020)	(0.016)
Clay soil (dummy)	-0.017	-0.012	-0.164*	-0.123*	-0.158**	-0.119*
J ( <del> J</del> )	(0.013)	(0.012)	(0.087)	(0.073)	(0.080)	(0.067)
Sandy-clay soil (dummy)	0.006	0.006	0.052	0.035	0.048	0.032
	(0.010)	(0.009)	(0.068)	(0.059)	(0.063)	(0.054)
Silty soil (dummy)	-0.004	0.002	-0.030	0.012	-0.031	0.008
	(0.013)	(0.011)	(0.087)	(0.073)	(0.080)	(0.067)

Table SM6: Full 2SLS estimates of the relationship between adoption and commercialization (Adoption) (continued)

variables	FE-MP	RE-MP	FE-QS	RE- $QS$	FE-SV	RE-SV
Constant	0.770***	0.964***	6.406***	6.987***	5.192***	5.635***
	(0.184)	(0.052)	(1.244)	(0.355)	(1.144)	(0.326)
Observations	8,604	8,604	8,604	8,604	8,604	8,604
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM7: Full 2SLS estimates of the relationship between adoption and commercialization (Area under Adoption)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Area under adoption (ha)	0.033***	0.023**	0.299***	0.253***	0.290***	0.247***
Age of household head (years)	(0.012) $0.002$ $(0.004)$	(0.011)	(0.084)	(0.076) -0.018	(0.078)	(0.070)
Sex of household head (dummy, male=1) $$	(0.004)	(0.004) -0.014	(0.024)	(0.024) $0.069$	(0.022)	(0.022) $0.078$
Education level (Number of years)		(0.020) $0.001$ $(0.001)$		(0.139) -0.002 (0.009)		(0.127) -0.003 (0.008)
Household size (number of persons)	0.002*** (0.001)	0.002*** (0.001)	0.029*** (0.005)	0.029*** (0.005)	0.028*** (0.005)	0.028*** (0.005)
Farmers group membership (dummy)	0.022*** (0.005)	0.022*** (0.005)	0.122*** (0.035)	0.123*** (0.035)	0.109*** (0.032)	0.110*** (0.032)
Training on agriculture (dummy)	-0.043***	-0.041***	-0.309***	-0.294***	-0.283***	-0.269***
Training on groundnut farming (dummy)	(0.012) -0.025***	(0.012) -0.026***	(0.078) -0.180***	(0.078) -0.182***	(0.072) -0.166***	(0.072) -0.168***
Public agricultural extension service (number of visits)	(0.003) $0.002$	(0.003) $0.003$	(0.023) $-0.023$	(0.023) -0.017	(0.021) $-0.024$	(0.021) -0.019
Private agricultural extension service (number of visits)	(0.002) $0.004$ $(0.003)$	(0.002) $0.004$ $(0.003)$	(0.016) $0.051**$ $(0.024)$	(0.017) 0.049** (0.023)	(0.015) $0.048**$ $(0.022)$	(0.015) 0.046** (0.022)
Cash credit for groundnut farming (dummy)	-0.006	-0.005	-0.146	-0.140	-0.154	-0.149
Credit in kind for groundnut farming (dummy)	(0.023) -0.046*** (0.016)	(0.023) $-0.044***$ $(0.016)$	(0.157) $-0.068$ $(0.110)$	(0.156) -0.058 (0.111)	(0.144) $-0.044$ $(0.102)$	(0.144) $-0.035$ $(0.102)$
Distance to the nearest urban market (km)	-0.000	-0.001***	-0.003	-0.009***	-0.003	-0.008***
Distance the nearest village market (km)	(0.000) -0.003***	(0.000) -0.003***	(0.002) -0.012*	(0.002) -0.016***	(0.002) -0.010*	(0.002) -0.015***
Crop rotation (dummy)	(0.001) -0.022** (0.011)	(0.001) -0.021* (0.011)	(0.006) -0.134* (0.073)	(0.005) -0.121* (0.073)	(0.006) -0.124* (0.067)	(0.005) -0.112* (0.067)
Mixed Crops (dummy)	0.005	0.001	-0.054	-0.073	-0.057	-0.074
Labor force (man.day)	(0.009) 0.002***	(0.009) 0.002***	(0.061) 0.027***	(0.061) 0.027***	(0.056) 0.026***	(0.056) 0.026***
Unit selling price (USD/kg)	(0.001) $0.050$	(0.001) $0.073$	(0.005) $0.269$	(0.005) $0.379$	(0.004) 1.682***	(0.004) 1.784***
Seed cost (USD/ha)	(0.049) 0.002***	(0.047) 0.002***	(0.333) 0.011***	(0.318) 0.011***	(0.306) 0.010***	(0.292) 0.010***
Fertilizer cost (USD/ha)	(0.000) $0.000$ $(0.000)$	(0.000) $0.000$ $(0.000)$	(0.002) 0.002* (0.001)	(0.002) 0.002* (0.001)	(0.001) $0.002*$ $(0.001)$	(0.001) 0.002* (0.001)
Pesticide cost (USD/ha)	-0.001***	-0.001***	-0.005*	-0.006**	-0.004	-0.005*
Labor cost (USD/ha)	(0.000) 0.000***	(0.000) 0.000***	(0.003) 0.002***	(0.003) 0.002***	(0.003) 0.002***	(0.003) 0.002***
Groundnut area (ha)	(0.000) -0.006	(0.000) -0.002	(0.001) 0.118***	(0.001) 0.137***	(0.001) $0.117***$	(0.001) $0.135***$
Off-farm income (dummy)	(0.005) -0.019	(0.005) $-0.021$	(0.033) -0.030	(0.032) -0.042	(0.031) -0.020	(0.029) $-0.030$
Dependency ratio	(0.015) $0.002$ $(0.003)$	(0.015) $0.002$ $(0.003)$	(0.098) $0.015$ $(0.022)$	(0.099) $0.018$ $(0.022)$	(0.091) $0.014$ $(0.020)$	(0.091) $0.017$ $(0.020)$
Clay soil (dummy)	-0.015	-0.012 (0.011)	-0.151*	-0.113	-0.145*	-0.109 (0.068)
Sandy-clay soil (dummy)	(0.013) $0.008$	0.007	(0.087) $0.064$	(0.074) $0.053$	(0.080) $0.059$	0.049
Silty soil (dummy)	(0.010) -0.004	(0.009) $0.002$	(0.069) -0.032	(0.059) $0.013$	(0.063) $-0.032$	(0.054) $0.010$
Constant	(0.013) 0.795***	(0.011) 1.003***	(0.087) 6.901***	(0.074) 7.211***	(0.080) 5.670***	(0.068) 5.868***
Observations	(0.183) $8,604$	(0.076) $8,604$	(1.240) $8,604$	(0.525) 8,604	(1.141) $8,604$	(0.481) $8,604$

Table SM7: Full 2SLS estimates of the relationship between adoption and commercialization (Area under Adoption) (continued)

variables	FE-MP	RE-MP	FE-QS	RE-QS	FE-SV	RE-SV
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM8: Full 2SLS estimates of the relationship between adoption, production and yields  $\,$ 

variables	FE-Prod	FE-ProdSUP	$FE\operatorname{-ProdVal}$	${\rm FE\text{-}ProdValSup}$	FE-Yield	FE-YieldSup
Adoption dummy	657.610***		426.589***		333.418***	
	(61.271)		(42.610)		(27.166)	
Age of household head (years)	-5.689	-10.898	-0.137	-3.517	-1.650	-4.244
	(12.368)	(12.411)	(8.601)	(8.439)	(5.483)	(5.772)
Household size (number of persons)	1.052	4.994*	-1.639	0.918	1.623	3.605***
	(2.522)	(2.556)	(1.754)	(1.738)	(1.118)	(1.189)
Farmers group membership (dummy)	15.416	9.491	17.999	14.154	-4.231	-7.186
	(18.035)	(18.076)	(12.542)	(12.292)	(7.996)	(8.406)
Training on agriculture (dummy)	30.407	32.404	13.535	14.829	28.002	29.054
	(40.632)	(40.660)	(28.257)	(27.649)	(18.015)	(18.909)
Training on groundnut farming (dummy)	9.514	6.534	5.426	3.493	1.121	-0.409
	(12.066)	(12.062)	(8.391)	(8.202)	(5.350)	(5.609)
Public agricultural extension service (number of visits)	-4.873	-6.533	-4.387	-5.465	-2.660	-3.469
	(8.562)	(8.580)	(5.954)	(5.835)	(3.796)	(3.990)
Private agricultural extension service (number of visits)	-16.058	-15.248	-9.929	-9.406	-3.798	-3.302
	(12.279)	(12.273)	(8.539)	(8.346)	(5.444)	(5.708)
Cash credit for groundnut farming (dummy)	-101.688	-55.081	-97.788*	-67.553	-34.280	-10.675
	(81.557)	(81.540)	(56.718)	(55.447)	(36.160)	(37.920)
Credit in kind for groundnut farming (dummy)	27.745	-24.527	35.763	1.847	-11.136	-37.283
	(56.951)	(57.502)	(39.605)	(39.101)	(25.250)	(26.741)
Distance to the nearest urban market (km)	-0.625	-0.351	-0.831	-0.653	0.268	0.405
	(1.034)	(1.036)	(0.719)	(0.704)	(0.458)	(0.482)
Distance the nearest village market (km)	-3.092	-2.166	-3.193	-2.592	-0.880	-0.410
	(3.344)	(3.345)	(2.326)	(2.275)	(1.483)	(1.556)
Crop rotation (dummy)	-64.875*	-28.369	-61.367**	-37.679	-0.107	18.082
	(37.660)	(38.209)	(26.190)	(25.982)	(16.697)	(17.769)
Mixed Crops (dummy)	1.058	17.203	-1.179	9.296	-4.068	4.035
	(31.642)	(31.726)	(22.005)	(21.573)	(14.029)	(14.754)
Labor force (man.day)	-5.352**	-3.481	-3.873**	-2.659	-1.867*	-0.933
	(2.447)	(2.467)	(1.701)	(1.678)	(1.085)	(1.147)
Unit selling price (USD/kg)	-214.873	-177.766	1,049.099***	1,073.062***	19.080	43.168
	(176.487)	(173.254)	(122.735)	(117.811)	(78.249)	(80.570)
Seed cost (USD/ha)	-0.937	-0.182	-0.627	-0.138	-0.299	0.085
	(0.815)	(0.810)	(0.567)	(0.551)	(0.361)	(0.377)
Fertilizer cost (USD/ha)	-1.690***	-0.987*	-1.585***	-1.129***	-0.318	0.038
	(0.558)	(0.557)	(0.388)	(0.379)	(0.248)	(0.259)
Pesticide cost (USD/ha)	3.015**	1.000	2.605**	1.298	0.533	-0.468
	(1.532)	(1.579)	(1.065)	(1.074)	(0.679)	(0.734)
Labor cost (USD/ha)	-0.134	0.165	-0.225	-0.031	-0.134	0.016
	(0.406)	(0.408)	(0.282)	(0.277)	(0.180)	(0.190)
Groundnut area (ha)	712.142***	582.511***	443.194***	359.092***	4.798	-60.396***

Table SM8: Full 2SLS estimates of the relationship between adoption, production and yields  $\left(continued\right)$ 

variables	FE-Prod	${\rm FE\text{-}ProdSUP}$	${\rm FE\text{-}ProdVal}$	${\rm FE\text{-}ProdValSup}$	FE-Yield	FE-YieldSup
	(11.886)	(17.299)	(8.266)	(11.763)	(5.270)	(8.045)
Off-farm income (dummy)	-49.557	-45.223	-29.786	-26.974	-32.864	-30.659
	(51.249)	(51.289)	(35.640)	(34.876)	(22.722)	(23.851)
Dependency ratio	-10.777	-5.419	-9.190	-5.713	-2.597	0.089
	(11.377)	(11.408)	(7.912)	(7.758)	(5.044)	(5.305)
Clay soil (dummy)	-9.792	11.088	-5.638	7.909	-8.945	1.522
	(45.431)	(45.547)	(31.594)	(30.971)	(20.143)	(21.181)
Sandy-clay soil (dummy)	19.180	37.723	23.247	35.277	-6.721	2.610
	(35.702)	(35.770)	(24.828)	(24.323)	(15.829)	(16.635)
Silty soil (dummy)	44.725	42.505	39.507	38.066	18.335	17.251
	(45.208)	(45.249)	(31.439)	(30.769)	(20.044)	(21.043)
Constant	130.485	536.181	-704.916	-410.969	568.515**	736.882**
	(649.998)	(645.982)	(452.031)	(439.261)	(288.191)	(300.408)
Observations	8,604	8,604	8,604	8,604	8,604	8,604
Number of id	2,868	2,868	2,868	2,868	2,868	2,868
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table SM9: Full 2SLS estimates of the relationship between continous adoption, production and yields  $\,$ 

variables	MP	QS	SV
Three years continuous adoption	0.002	0.104	0.118
	(0.057)	(0.358)	(0.328)
Age of household head	-0.001	-0.046	-0.044
	(0.009)	(0.056)	(0.051)
Household size	0.003***	0.028***	0.026***
	(0.001)	(0.006)	(0.005)
Farmers group membership	0.029***	0.196***	0.179***
	(0.006)	(0.041)	(0.037)
Training on agriculture	-0.033**	-0.199**	-0.179**
	(0.014)	(0.089)	(0.081)
Training on groundnut farming	-0.029***	-0.205***	-0.191***
0 0	(0.004)	(0.026)	(0.024)
Public agricultural extension service	0.004	-0.015	-0.016
0	(0.003)	(0.018)	(0.016)
Private agricultural extension service	0.002	0.051**	0.049**
	(0.004)	(0.026)	(0.023)
Cash credit for groundnut farming	0.031	0.125	0.087
3	(0.028)	(0.178)	(0.163)
Credit in kind for groundnut farming	-0.065***	-0.134	-0.099
	(0.020)	(0.128)	(0.117)
Distance to the nearest urban market	0.000	-0.003	-0.003
	(0.000)	(0.003)	(0.003)
Distance the nearest village market	-0.005***	-0.021***	-0.018**
<u> </u>	(0.001)	(0.008)	(0.007)
Crop rotation	-0.034***	-0.177**	-0.162**
	(0.013)	(0.082)	(0.075)
Mixed Crops	0.008	0.126*	0.116*
•	(0.011)	(0.069)	(0.063)
Labor force	0.005***	0.045***	0.043***
	(0.001)	(0.006)	(0.006)
Unit selling price	0.247***	1.837***	2.978***
o r	(0.043)	(0.271)	(0.247)
Seed cost	0.002***	0.016***	0.015***
	(0.000)	(0.002)	(0.002)
Fertilizer cost	0.000**	0.005***	0.005***
	(0.000)	(0.001)	(0.001)
Pesticide cost	-0.000	0.001	0.001
	(0.001)	(0.004)	(0.004)
Labor cost	0.001***	0.004***	0.004***
	(0.000)	(0.001)	(0.001)
Groundnut area	0.015***	0.281***	0.270***
	0.0-0		,. <u> </u>

Table SM9: Full 2SLS estimates of the relationship between continous adoption, production and yields (continued)

variables	MP	QS	SV
	(0.004)	(0.027)	(0.024)
Off-farm income	-0.038**	-0.085	-0.058
	(0.019)	(0.120)	(0.110)
Dependency ratio	-0.012***	-0.074***	-0.066***
	(0.004)	(0.027)	(0.025)
Clay soil	-0.016	-0.174*	-0.168*
	(0.016)	(0.102)	(0.093)
Sandy-clay soil	0.004	0.028	0.026
	(0.013)	(0.082)	(0.075)
Silty soil	0.004	-0.057	-0.064
	(0.017)	(0.106)	(0.097)
Constant	-0.008	0.101	0.137
	(0.113)	(0.716)	(0.654)
Observations	5,418	5,418	5,418
Number of id	2,555	2,555	2,555
District FE	YES	YES	YES
Year FE	YES	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1			

5 Correlated random effects

Table SM10: Full Correlated random effects estimations of the relationship between adoption , commercialization and market orientation  $\,$ 

variables	OLS-Share	FE-Share	RE-Share	OLS-orientation	FE-orientation	RE-orientation
Adoption dummy	-0.030**	-0.043*	-0.058***	-0.058***	-0.069	-0.093***
Age of household head (years)	(0.013) -0.001** (0.000)	(0.023) -0.018*** (0.005)	(0.018) -0.017*** (0.004)	(0.022) -0.001** (0.001)	(0.043) $-0.024***$ $(0.009)$	(0.031) -0.025*** (0.008)
Sex of household head (dummy, male=1)	-0.005	, ,	-0.004	0.013	,	0.012
Education level (Number of years)	(0.016) -0.002* (0.001)		(0.018) -0.002* (0.001)	(0.024) -0.004** (0.002)		(0.029) -0.005** (0.002)
Household size (number of persons)	0.001 $(0.001)$	0.003*** (0.001)	0.002*** (0.001)	0.001 (0.001)	0.004** (0.002)	0.004*** (0.002)
Farmers group membership (dummy)	0.013*** (0.004)	0.017** (0.007)	0.017*** (0.006)	0.013* (0.008)	0.021* (0.013)	0.018 (0.011)
Training on agriculture (dummy)	-0.050*** (0.011)	-0.040*** (0.015)	-0.044*** (0.014)	-0.054*** (0.018)	-0.066** (0.028)	-0.071*** (0.024)
Training on groundnut farming (dummy)	-0.020***	-0.023***	-0.025***	-0.018***	-0.023***	-0.026***
Public agricultural extension service (number of visits)	(0.004) -0.005** (0.002)	(0.005) -0.007** (0.003)	(0.004) -0.007** (0.003)	(0.006) -0.007* (0.004)	(0.008) -0.013** (0.006)	(0.007) -0.012** (0.005)
Private agricultural extension service (number of visits)	0.005* (0.003)	0.008* (0.004)	0.008** (0.004)	0.004 (0.005)	0.005 (0.008)	0.009 (0.007)
Cash credit for groundnut farming (dummy)	-0.002	0.003	-0.030	-0.035	-0.012	-0.063
Credit in kind for groundnut farming (dummy)	(0.021) $0.003$ $(0.013)$	(0.031) $-0.025$ $(0.022)$	(0.027) -0.008 (0.019)	(0.038) -0.012 (0.024)	(0.056) $-0.062$ $(0.040)$	(0.049) $-0.025$ $(0.035)$
Distance to the nearest urban market (km)	-0.003***	-0.001	-0.002***	-0.003***	-0.001	-0.003***
Distance the nearest village market (km)	(0.000) -0.002** (0.001)	(0.001) -0.000 (0.001)	(0.000) -0.001 (0.001)	(0.001) -0.001 (0.002)	(0.001) $0.002$ $(0.002)$	(0.001) 0.000 (0.002)
Crop rotation (dummy)	0.023** (0.010)	-0.000 (0.014)	-0.002 (0.013)	0.013 (0.016)	-0.014 (0.026)	-0.023 (0.023)
Mixed Crops (dummy)	0.005	0.016	0.014	0.010	0.045**	0.036*
Labor force (man.day)	(0.008) 0.003*** (0.001)	(0.012) 0.003*** (0.001)	(0.011) 0.002*** (0.001)	(0.014) 0.004*** (0.001)	(0.022) $0.003$ $(0.002)$	(0.019) $0.003$ $(0.002)$
Unit selling price $(USD/kg)$	-0.023	0.046	0.051	-0.057	-0.036	-0.012
Seed cost (USD/ha)	(0.046) 0.001*** (0.000)	(0.065) 0.002*** (0.000)	(0.055) 0.002*** (0.000)	(0.080) 0.002*** (0.000)	(0.119) $0.002***$ $(0.001)$	(0.098) 0.002*** (0.001)
Fertilizer cost (USD/ha)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.000) 0.001*** (0.000)	0.002*** (0.000)	0.001) 0.001*** (0.000)
Pesticide cost (USD/ha)	0.002***	0.001*	0.002***	0.003***	0.003**	0.003***

Table SM10: Full Correlated random effects estimations of the relationship between adoption , commercialization and market orientation (continued)

variables	OLS-Share	FE-Share	RE-Share	OLS-orientation	FE-orientation	RE-orientation
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Labor cost (USD/ha)	0.001***	0.001***	0.001***	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Groundnut area (ha)	-0.002	-0.013***	-0.010**	-0.014***	-0.018**	-0.014*
	(0.002)	(0.005)	(0.004)	(0.004)	(0.008)	(0.007)
Off-farm income (dummy)	0.003	0.010	-0.003	0.035	0.028	0.015
	(0.013)	(0.021)	(0.018)	(0.024)	(0.038)	(0.033)
Dependency ratio	0.002	-0.003	0.000	0.003	-0.000	0.002
	(0.003)	(0.005)	(0.004)	(0.005)	(0.009)	(0.007)
Clay soil (dummy)	0.015	-0.004	0.006	0.036*	0.011	0.026
	(0.012)	(0.017)	(0.012)	(0.020)	(0.032)	(0.021)
Sandy-clay soil (dummy)	0.019*	0.013	0.012	0.020	0.024	0.013
	(0.010)	(0.014)	(0.010)	(0.017)	(0.025)	(0.017)
Silty soil (dummy)	0.010	-0.023	0.001	-0.009	-0.055*	-0.017
	(0.012)	(0.018)	(0.012)	(0.021)	(0.033)	(0.021)
Constant	0.445***	1.073***	0.649***	0.461***	1.503***	0.666***
	(0.038)	(0.253)	(0.073)	(0.063)	(0.462)	(0.119)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.290			0.182		
Number of id		2,555	2,555		2,555	2,555
District FE		YES	YES		YES	YES
Year FE		Yes	Yes		Yes	Yes
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Table SM11: Full Correlated random effects estimations of the relationship between adoption (area), commercialization and market orientation

variables	OLS-Share	FE-Share	RE-share	OLS-orientation	FE-orientation	RE-orientation
Area under adoption (ha)	-0.010***	-0.032*	-0.040***	-0.013*	-0.051	-0.065***
Age of household head (years)	(0.004) -0.001** (0.000)	(0.018) -0.017*** (0.005)	(0.013) -0.016*** (0.004)	(0.007) -0.001** (0.001)	(0.032) -0.023** (0.009)	(0.022) -0.023*** (0.008)
Sex of household head (dummy, male=1)	-0.005		-0.003	0.012		0.013
Education level (Number of years)	(0.016) -0.002* (0.001)		(0.018) -0.003** (0.001)	(0.024) -0.004** (0.002)		(0.029) -0.005*** (0.002)
Household size (number of persons)	0.001 (0.001)	0.003*** (0.001)	0.002** (0.001)	0.001 (0.001)	0.004** (0.002)	0.004** (0.002)
Farmers group membership (dummy)	0.014*** (0.004)	0.017** (0.007)	0.017*** (0.006)	0.014* (0.008)	0.021* (0.013)	0.018 (0.011)
Training on agriculture (dummy)	-0.050*** (0.011)	-0.041*** (0.015)	-0.045*** (0.014)	-0.054*** (0.017)	-0.066** (0.028)	-0.074*** (0.025)
Training on groundnut farming (dummy)	-0.020***	-0.023***	-0.025***	-0.017***	-0.023***	-0.026***
Public agricultural extension service (number of visits)	(0.004) -0.005** (0.002)	(0.005) -0.008** (0.003)	(0.004) -0.007** (0.003)	(0.006) -0.008** (0.004)	(0.008) -0.013** (0.006)	(0.007) -0.012** (0.005)
Private agricultural extension service (number of visits) $% \left( \frac{1}{2}\right) =\frac{1}{2}\left( \frac{1}{2}\right) \left( \frac{1}{2}\right) $	0.005 (0.003)	0.008* (0.004)	0.008** (0.004)	0.002 (0.005)	0.005 (0.008)	0.009 (0.007)
Cash credit for groundnut farming (dummy)	-0.003	-0.005	-0.038	-0.038	-0.025	-0.075
Credit in kind for groundnut farming (dummy)	(0.021) $0.004$ $(0.013)$	(0.031) $-0.022$ $(0.022)$	(0.027) $-0.004$ $(0.020)$	(0.038) -0.012 (0.025)	(0.056) -0.057 (0.041)	(0.049) -0.018 (0.035)
Distance to the nearest urban market (km)	-0.003***	-0.001	-0.002***	-0.003***	-0.001	-0.003***
Distance the nearest village market (km)	(0.000) -0.002** (0.001)	(0.001) -0.000 (0.001)	(0.000) $-0.001$ $(0.001)$	(0.001) -0.001 (0.002)	(0.001) $0.002$ $(0.002)$	(0.001) $0.000$ $(0.002)$
Crop rotation (dummy)	0.022** (0.010)	-0.002 (0.014)	-0.005 (0.013)	0.013 (0.016)	-0.017 (0.026)	-0.028 (0.023)
Mixed Crops (dummy)	0.006	0.015	0.013	0.011	0.044**	0.035*
Labor force (man.day)	(0.008) 0.003***	(0.012) 0.003***	(0.011) 0.002**	(0.014) 0.004***	(0.022) 0.003	(0.019) 0.002
Unit selling price (USD/kg)	(0.001) -0.055	(0.001) $0.051$	(0.001) $0.055$	(0.001) -0.143**	(0.002) -0.030	(0.002) -0.007
Seed cost (USD/ha)	(0.040) 0.001*** (0.000)	(0.068) 0.002*** (0.000)	(0.056) 0.002*** (0.000)	(0.068) 0.002*** (0.000)	(0.123) $0.002***$ $(0.001)$	(0.100) $0.002***$ $(0.001)$
Fertilizer cost (USD/ha)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Pesticide cost (USD/ha)	0.002***	0.001**	0.002***	0.003***	0.003**	0.004***

Table SM11: Full Correlated random effects estimations of the relationship between adoption (area), commercialization and market orientation (continued)

variables	OLS-Share	FE-Share	RE-share	OLS-orientation	FE-orientation	RE-orientation
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Labor cost (USD/ha)	0.001***	0.001***	0.001***	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Groundnut area (ha)	0.000	-0.004	0.002	-0.011**	-0.004	0.004
	(0.003)	(0.007)	(0.006)	(0.005)	(0.012)	(0.010)
Off-farm income (dummy)	0.003	0.013	0.001	0.035	0.031	0.021
	(0.013)	(0.021)	(0.018)	(0.024)	(0.038)	(0.033)
Dependency ratio	0.002	-0.003	0.000	0.003	-0.000	0.002
	(0.003)	(0.005)	(0.004)	(0.005)	(0.009)	(0.007)
Clay soil (dummy)	0.014	-0.005	0.001	0.035*	0.010	0.017
	(0.012)	(0.018)	(0.012)	(0.020)	(0.032)	(0.021)
Sandy-clay soil (dummy)	0.018*	0.013	0.009	0.019	0.024	0.007
	(0.010)	(0.014)	(0.010)	(0.017)	(0.025)	(0.017)
Silty soil (dummy)	0.009	-0.021	0.000	-0.009	-0.053	-0.018
	(0.012)	(0.018)	(0.012)	(0.021)	(0.033)	(0.021)
Constant	0.459***	1.026***	0.631***	0.499***	1.431***	0.639***
	(0.036)	(0.260)	(0.075)	(0.060)	(0.474)	(0.124)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.290			0.181		
Number of id		2,555	2,555		2,555	2,555
District FE		YES	YES		YES	YES
Year FE		Yes	Yes		Yes	Yes
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

# 6 Causal mediation analysis

Table SM12: Linear IV mediation analysis of adoption and commercialization (production)  $\,$ 

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	0.0422**	0.481***	0.469***
	(0.0190)	(0.130)	(0.119)
Direct effect	-0.0371	-0.768**	-0.783**
	(0.0445)	(0.356)	(0.336)
Indirect effect	0.0792	1.249***	1.252***
	(0.0589)	(0.477)	(0.452)
Observations	8,604	8,604	8,604
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE (%)	187.9	259.7	266.8
F statistic on instrument (1)	5169	5169	5169
F statistic on instruments (2) Standard errors in parentheses	21.19	21.19	21.19
*** p<0.01, ** p<0.05, * p<0.1			

Table SM13: Linear IV mediation analysis of adoption and commercialization (Yield)

variables	Sellers	Quantity Sold	Sales Value
Total effect (TE)	0.0422**	0.481***	0.469***
	(0.0190)	(0.130)	(0.119)
Direct effect	-0.0664	-1.230**	-1.246**
	(0.0675)	(0.576)	(0.551)
Indirect effect	0.109	1.711**	1.715**
	(0.0828)	(0.714)	(0.684)
Observations	8,604	8,604	8,604
Additional controls	YES	YES	YES
District dummies	YES	YES	YES
Mediator share of TE $(\%)$	257.4	355.8	365.5
F statistic on instrument (1)	5169	5169	5169
F statistic on instruments (2) Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	13.38	13.38	13.38

7 Cross country analysis

Table SM14: 2SLS estimates of the relationship between adoption and commercialization and yield across countries  $\,$ 

		Ghana	Mali		Nigeria	
variables	Yield	Commercialization	Yield	Commercialization	Yield	Commercialization
Adoption dummy	198.475**	-0.557	66.646**	-0.141	373.278***	0.301***
	(88.525)	(0.501)	(33.390)	(0.311)	(25.196)	(0.074)
Age of household head (years)	0.406	-0.095	0.083	-0.014**	-3.233	-0.069***
	(16.311)	(0.083)	(0.475)	(0.006)	(8.937)	(0.023)
Sex of household head (dummy, male=1)	-58.257**	-0.170	24.809	-0.308	20.482	0.899***
	(28.936)	(0.232)	(26.855)	(0.348)	(48.954)	(0.192)
Education level (Number of years)	0.110	0.034	-2.087	-0.035	3.167*	-0.001
	(2.862)	(0.023)	(2.355)	(0.031)	(1.747)	(0.007)
Household size (number of persons)	0.636	0.021	1.006	0.004	0.010	0.043***
	(4.523)	(0.022)	(0.669)	(0.007)	(2.300)	(0.006)
Farmers group membership (dummy)	4.595	0.495***	-6.867	0.009	-1.255	0.024
	(17.846)	(0.089)	(6.863)	(0.067)	(14.136)	(0.036)
Training on agriculture (dummy)	44.591	0.172	9.263	-0.571***	25.793	-0.107
	(46.961)	(0.233)	(13.136)	(0.128)	(32.491)	(0.083)
Training on groundnut farming (dummy)	5.023	-0.054	5.172	-0.314***	-2.818	-0.069**
	(15.475)	(0.077)	(8.066)	(0.073)	(11.287)	(0.029)
Public agricultural extension service (number of visits)	1.280	0.008	-2.751	-0.028	-0.229	-0.050***
	(7.857)	(0.039)	(4.690)	(0.044)	(6.118)	(0.016)
Private agricultural extension service (number of visits)	0.680	0.072	8.931*	0.058	-0.805	0.080***
	(10.184)	(0.051)	(5.135)	(0.049)	(11.113)	(0.028)
Cash credit for groundnut farming (dummy)	109.641	-0.111	8.110	-0.290	-96.634	0.106
	(91.464)	(0.455)	(32.337)	(0.297)	(59.789)	(0.153)
Credit in kind for groundnut farming (dummy)	-45.602	-1.432***	45.213	0.280	-29.923	0.617***
	(64.085)	(0.319)	(27.845)	(0.268)	(37.305)	(0.095)
Distance to the nearest urban market (km)	2.369	0.071***	-0.092	-0.040***	-0.042	-0.003*
	(2.494)	(0.015)	(0.525)	(0.005)	(0.549)	(0.001)
Distance the nearest village market (km)	-0.574	-0.012	-2.552***	-0.028***	0.569	0.005
	(3.130)	(0.019)	(0.870)	(0.008)	(2.840)	(0.009)
Crop rotation (dummy)	33.715	-0.448**	-3.575	0.626***	-8.976	-0.162**
	(36.880)	(0.185)	(16.322)	(0.160)	(26.833)	(0.069)
Mixed Crops (dummy)	1.771	-1.206***	-10.554	-0.140	6.306	0.092
	(35.228)	(0.175)	(12.650)	(0.123)	(23.262)	(0.059)
Labor force (man.day)	-1.087	0.064***	-1.643	0.046***	-1.828	0.019***
	(3.575)	(0.018)	(1.169)	(0.011)	(1.575)	(0.004)
Unit selling price (USD/kg)	-82.306	1.489*	133.283	-0.727	126.910	0.407
	(149.874)	(0.771)	(100.291)	(0.872)	(95.094)	(0.256)
Seed cost (USD/ha)	-0.075	0.031***	-0.096	0.002	-0.374	0.005**
	(0.913)	(0.005)	(0.306)	(0.003)	(0.755)	(0.002)
Fertilizer cost (USD/ha)	-0.442	0.035**	-0.546	0.018***	-0.055	0.001
	(2.730)	(0.015)	(0.391)	(0.004)	(0.323)	(0.001)

Table SM14: 2SLS estimates of the relationship between adoption and commercialization and yield across countries (continued)

variables	Yield	Commercialization	Yield	Commercialization	Yield	Commercialization
Pesticide cost (USD/ha)	-0.643	-0.033**	0.307	0.004	0.147	0.005**
, , ,	(2.680)	(0.013)	(0.729)	(0.007)	(0.928)	(0.002)
Labor cost (USD/ha)	-0.327	0.003	-0.347*	0.002	-0.006	0.002**
, , ,	(0.384)	(0.002)	(0.208)	(0.002)	(0.282)	(0.001)
Groundnut area (ha)	5.053	-0.080	0.561	0.384***	-3.373	0.223***
	(13.991)	(0.070)	(3.734)	(0.037)	(9.832)	(0.025)
Off-farm income (dummy)	57.474	-0.947**	39.093	-0.608	-51.019*	0.124*
	(93.944)	(0.466)	(39.762)	(0.411)	(27.937)	(0.071)
Dependency ratio	-2.751	-0.067	-0.736	-0.119**	-2.717	0.054***
	(14.027)	(0.070)	(5.426)	(0.053)	(7.012)	(0.018)
Clay soil (dummy)	24.369	0.040	5.305	-0.261	-3.759	-0.068
	(32.001)	(0.188)	(18.647)	(0.178)	(21.723)	(0.067)
Sandy-clay soil (dummy)	4.704	0.134	1.097	0.055	-6.283	0.013
	(26.400)	(0.156)	(15.708)	(0.149)	(16.916)	(0.051)
Silty soil (dummy)	56.265*	0.008	13.858	0.009	-1.547	0.029
	(33.087)	(0.200)	(18.359)	(0.175)	(21.509)	(0.066)
Constant	869.112***	0.222	474.191***	7.394***	540.381***	5.076***
	(144.262)	(1.103)	(69.625)	(0.717)	(128.192)	(0.490)
Observations	1,494	1,494	2,520	2,520	4,590	4,590
Number of id	498	498	840	840	1,530	1,530
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

8 Robustness checks

8.1 Control function approach

Table SM15: Full Control function estimations of the relationship between adoption and market participation

variables	MP-FE	MP-CRE	QS-FE	QS-CRE	SV-FE	SV-CRE
Adoption dummy	0.073**	0.041*	0.598***	0.416***	0.588***	0.417***
	(0.029)	(0.023)	(0.187)	(0.150)	(0.171)	(0.137)
Age of household head (years)	0.002	-0.001	-0.031	-0.047	-0.033	-0.047
Sex of household head (dummy, male=1)	(0.006)	(0.006) -0.024	(0.039)	(0.035) $0.014$	(0.035)	(0.032) $0.029$
Sex of nousehold head (dummy, male=1)		-0.024		0.014		0.029
		(0.024)		(0.159)		(0.145)
Education level (Number of years)		0.001		-0.001		-0.001
Household size (number of persons)	0.003**	(0.002) 0.003**	0.029***	(0.011) 0.027***	0.026***	(0.010) 0.026***
reduction size (number of persons)	(0.001)	(0.001)	(0.008)	(0.007)	(0.007)	(0.006)
Farmers group membership (dummy)	0.028***	0.031***	0.187***	0.201***	0.172***	0.183***
raimers group membership (duminy)	(0.009)	(0.008)	(0.055)	(0.051)	(0.050)	(0.046)
Training on agriculture (dummy)	-0.032*	-0.040**	-0.198	-0.271**	-0.179	-0.248**
	(0.019)	(0.018)	(0.121)	(0.111)	(0.110)	(0.102)
Training on groundnut farming (dummy)	-0.028***	-0.034***	-0.197***	-0.234***	-0.183***	-0.217***
	(0.006)	(0.005)	(0.036)	(0.033)	(0.033)	(0.030)
Public agricultural extension service (number of visits)	0.003	0.006*	-0.026	-0.002	-0.026	-0.005
	(0.004)	(0.004)	(0.024)	(0.023)	(0.022)	(0.021)
Private agricultural extension service (number of visits)	0.002	0.001	0.042	0.035	0.039	0.033
	(0.006)	(0.005)	(0.035)	(0.033)	(0.032)	(0.030)
Cash credit for groundnut farming (dummy)	0.021	0.011	0.049	-0.045	0.015	-0.072
	(0.038)	(0.035)	(0.243)	(0.222)	(0.222)	(0.203)
Credit in kind for groundnut farming (dummy)	-0.066**	-0.048*	-0.152	-0.022	-0.120	0.003
Distance to the mount unbou moulet (lun)	(0.027) -0.000	(0.025) -0.003***	(0.174) $-0.004$	(0.158) -0.021***	(0.159) -0.004	(0.144) -0.020***
Distance to the nearest urban market (km)	-0.000	-0.003	-0.004	-0.021	-0.004	-0.020
	(0.001)	(0.000)	(0.004)	(0.003)	(0.004)	(0.003)
Distance the nearest village market (km)	-0.006***	-0.005***	-0.026**	-0.029***	-0.023**	-0.026***
Crop rotation (dummy)	(0.002) -0.037**	(0.001) -0.023	(0.011) -0.194*	(0.008) $-0.122$	(0.010) -0.176*	(0.007) -0.111
Crop rotation (duminy)	(0.018)	(0.016)	(0.111)	(0.103)	(0.102)	(0.094)
16 16 (1	, ,	` ′	` /	, ,	` /	` ′
Mixed Crops (dummy)	0.011	0.019	0.140	0.160*	0.129	0.145*
Labor force (man.day)	(0.015) 0.005***	(0.014) 0.004***	(0.094) 0.044***	(0.087) 0.036***	(0.086) 0.042***	(0.080) $0.035***$
Labor force (main.day)	(0.001)	(0.001)	(0.009)	(0.008)	(0.008)	(0.007)
Unit selling price (USD/kg)	0.096	0.156**	0.618	0.957**	1.781***	2.131***
3. ( ) 0/		(0.070)		(0.456)	(0.470)	(0.416)
Seed cost (USD/ha)	(0.082) $0.002***$	(0.072) $0.002***$	(0.521) 0.015***	(0.456) 0.016***	(0.476) $0.014***$	(0.416) $0.014***$
Seed cost (CSD/IIa)	(0.002)	(0.002)	(0.003)	(0.010)	(0.002)	(0.002)
Fertilizer cost (USD/ha)	0.000	0.000	0.004**	0.004**	0.004**	0.004**
(42-7-20)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)	(0.002)
Pesticide cost (USD/ha)	-0.000	-0.001	0.001	0.001	0.000	0.001
1 esticide cost (USD/IIa)	-0.000	-0.001	0.001	0.001	0.000	0.001

Table SM15: Full Control function estimations of the relationship between adoption and market participation (continued)

variables	MP- $FE$	MP-CRE	QS- $FE$	QS-CRE	$SV ext{-}FE$	SV-CRE
	(0.001)	(0.001)	(0.006)	(0.005)	(0.005)	(0.004)
Labor cost (USD/ha)	0.001***	0.001***	0.004***	0.004***	0.004***	0.004***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Groundnut area (ha)	0.014**	0.017***	0.274***	0.303***	0.263***	0.291***
	(0.006)	(0.005)	(0.036)	(0.033)	(0.033)	(0.031)
Off-farm income (dummy)	-0.041	-0.038	-0.110	-0.143	-0.082	-0.119
	(0.026)	(0.023)	(0.164)	(0.148)	(0.150)	(0.136)
Dependency ratio	-0.011*	-0.004	-0.071*	-0.027	-0.064*	-0.024
	(0.006)	(0.005)	(0.037)	(0.033)	(0.034)	(0.030)
Clay soil (dummy)	-0.012	-0.003	-0.154	-0.063	-0.149	-0.065
	(0.022)	(0.016)	(0.139)	(0.101)	(0.127)	(0.092)
Sandy-clay soil (dummy)	0.009	0.009	0.056	0.052	0.050	0.046
	(0.017)	(0.013)	(0.111)	(0.082)	(0.101)	(0.075)
Silty soil (dummy)	0.012	0.016	-0.013	0.056	-0.026	0.044
	(0.023)	(0.016)	(0.143)	(0.102)	(0.131)	(0.094)
Constant	0.509*	0.965***	5.042***	6.685***	4.083**	5.467***
	(0.305)	(0.096)	(1.932)	(0.632)	(1.766)	(0.577)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.116		0.150		0.175	
Number of id	2,555	2,555	2,555	2,555	2,555	2,555
District FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						

### 8.2 Hausman Taylor IV

Table SM16: Full HAUSMAN TAYLOR IV estimations

variables	MP	QS	SV
Age of household head (years)	-0.004***	-0.031***	-0.031***
	(0.001)	(0.005)	(0.005)
Household size (number of persons)	0.000	0.007	0.007
	(0.001)	(0.005)	(0.005)
Farmers group membership (dummy)	0.015**	0.110***	0.110***
	(0.006)	(0.040)	(0.040)
Training on agriculture (dummy)	-0.063***	-0.385***	-0.385***
0 0 ( 0,	(0.014)	(0.089)	(0.089)
Training on groundnut farming (dummy)	-0.017***	-0.096***	-0.096***
3 3 4 4 4 5	(0.004)	(0.028)	(0.028)
Public agricultural extension service (number of visits)	-0.007**	-0.065***	-0.065***
rublic agricultural extension service (number of visits)			
	(0.003)	(0.018)	(0.018)
Private agricultural extension service (number of visits)	-0.004	-0.026	-0.026
	(0.004)	(0.027)	(0.027)
Cash credit for groundnut farming (dummy)	0.057**	0.304	0.304
	(0.029)	(0.188)	(0.188)
Credit in kind for groundnut farming (dummy)	-0.058***	-0.117	-0.117
- 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(0.020)	(0.131)	(0.131)
Distance to the nearest urban market (km)	-0.001***	-0.006**	-0.006**
Distance to the nearest aroun market (im)	(0.000)	(0.003)	(0.003)
	, ,	, ,	` ′
Distance the nearest village market (km)	-0.007***	-0.041***	-0.041***
	(0.001)	(0.008)	(0.008)
Crop rotation (dummy)	-0.047***	-0.434***	-0.434***
	(0.012)	(0.079)	(0.079)
Mixed Crops (dummy)	0.051***	0.382***	0.382***
	(0.011)	(0.070)	(0.070)
Labor force (man.day)	0.006***	0.053***	0.053***
	(0.001)	(0.006)	(0.006)
Unit selling price (USD/kg)	-0.044	-0.152	-0.152
ome seming price (CSD/Rg)	(0.065)	(0.411)	(0.411)
Sand and (HSD/ha)	0.003***	0.018***	0.018***
Seed cost (USD/ha)			
T (TTGT (1)	(0.000)	(0.002)	(0.002)
Fertilizer cost (USD/ha)	0.001***	0.010***	0.010***
	(0.000)	(0.001)	(0.001)
Pesticide cost (USD/ha)	-0.001	0.003	0.003
	(0.001)	(0.004)	(0.004)
Labor cost (USD/ha)	0.001***	0.002**	0.002**
	(0.000)	(0.001)	(0.001)
Groundnut area (ha)	0.039***	0.457***	0.457***
	(0.004)	(0.025)	(0.025)
Off-farm income (dummy)	-0.036*	-0.051	-0.051
on rain moome (duminy)	(0.018)	(0.121)	(0.121)
Dependency ratio	0.000	-0.012	-0.012
Dependency ratio			
	(0.004)	(0.027)	(0.027)
Clay soil (dummy)	-0.020	-0.187*	-0.187*
	(0.017)	(0.108)	(0.108)
Sandy-clay soil (dummy)	-0.003	-0.019	-0.019
	(0.013)	(0.088)	(0.088)
Silty soil (dummy)	0.003	-0.061	-0.061
	(0.017)	(0.111)	(0.111)
		0.050***	0.656***
Adoption dummy	0.087***	0.656***	
Adoption dummy			(0.123)
	(0.019)	(0.123)	` ,
Adoption dummy Sex of household head (dummy, male=1)	(0.019) -0.048	(0.123) $-0.065$	-0.065
Sex of household head (dummy, male=1)	(0.019) -0.048 (0.029)	(0.123) $-0.065$ $(0.207)$	(0.123) -0.065 (0.207)
	(0.019) -0.048	(0.123) $-0.065$	-0.065 (0.207)
Sex of household head (dummy, male=1)	(0.019) -0.048 (0.029) 0.002 (0.002)	(0.123) -0.065 (0.207) 0.012 (0.013)	-0.065 (0.207) 0.012 (0.013)
Sex of household head (dummy, male=1)	(0.019) -0.048 (0.029) 0.002	(0.123) -0.065 (0.207) 0.012	-0.065

Table SM16: Full HAUSMAN TAYLOR IV estimations (continued)

variables	MP	QS	SV
Observations	5,418	5,418	5,418
Number of id	2,555	2,555	2,555
Standard errors in parentheses *** $p<0.01$ , ** $p<0.05$ , * $p<0.1$			

#### 8.3 Lewbels Test

Table SM17: Full Lewbel instrumental variable estimations of the relationship between adoption and commercialization  ${\cal C}$ 

variables	MP	QS	SV	MP-Access	QS-Access	SV-Access
Adoption dummy	0.108***	0.769***	0.718***	0.108***	0.769***	0.718***
	(0.026)	(0.162)	(0.149)	(0.026)	(0.162)	(0.149)
Age of household head	-0.002	-0.050	-0.049	-0.002	-0.050	-0.049
	(0.006)	(0.041)	(0.038)	(0.006)	(0.041)	(0.038)
Household size	0.003*	0.027**	0.025**	0.003*	0.027**	0.025**
	(0.002)	(0.011)	(0.010)	(0.002)	(0.011)	(0.010)
Farmers group membership	0.030**	0.207***	0.189***	0.030**	0.207***	0.189***
	(0.012)	(0.078)	(0.071)	(0.012)	(0.078)	(0.071)
Training on agriculture	-0.035	-0.212	-0.191	-0.035	-0.212	-0.191
	(0.027)	(0.171)	(0.157)	(0.027)	(0.171)	(0.157)
Training on groundnut farming	-0.026***	-0.188***	-0.175***	-0.026***	-0.188***	-0.175***
	(0.008)	(0.050)	(0.045)	(0.008)	(0.050)	(0.045)
Public agricultural extension service	0.004	-0.019	-0.020	0.004	-0.019	-0.020
	(0.005)	(0.031)	(0.028)	(0.005)	(0.031)	(0.028)
Private agricultural extension service	-0.002	0.022	0.022	-0.002	0.022	0.022
	(0.007)	(0.046)	(0.042)	(0.007)	(0.046)	(0.042)
Cash credit for groundnut farming	0.026	0.089	0.053	0.026	0.089	0.053
	(0.049)	(0.318)	(0.292)	(0.049)	(0.318)	(0.292)
Credit in kind for groundnut farming	-0.073*	-0.189	-0.151	-0.073*	-0.189	-0.151
	(0.038)	(0.248)	(0.231)	(0.038)	(0.248)	(0.231)
Distance to the nearest urban market	0.000	-0.002	-0.003	0.000	-0.002	-0.003
	(0.001)	(0.005)	(0.005)	(0.001)	(0.005)	(0.005)
Distance the nearest village market	-0.005*	-0.023	-0.020	-0.005*	-0.023	-0.020
	(0.003)	(0.018)	(0.017)	(0.003)	(0.018)	(0.017)
Crop rotation	-0.030	-0.144	-0.132	-0.030	-0.144	-0.132
	(0.025)	(0.152)	(0.138)	(0.025)	(0.152)	(0.138)
Mixed Crops	0.008	0.120	0.111	0.008	0.120	0.111
•	(0.021)	(0.134)	(0.123)	(0.021)	(0.134)	(0.123)
Labor force	0.005***	0.044***	0.042***	0.005***	0.044***	0.042***
	(0.002)	(0.012)	(0.011)	(0.002)	(0.012)	(0.011)
Unit selling price	0.031	0.287	1.535***	0.031	0.287	1.535***
	(0.081)	(0.511)	(0.469)	(0.081)	(0.511)	(0.469)
Seed cost	0.002***	0.015***	0.013***	0.002***	0.015***	0.013***
	(0.001)	(0.004)	(0.004)	(0.001)	(0.004)	(0.004)
Fertilizer cost	0.000	0.004**	0.004**	0.000	0.004**	0.004**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)
Pesticide cost	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.007)	(0.006)	(0.001)	(0.007)	(0.006)
Labor cost	0.001**	0.004**	0.004**	0.001**	0.004**	0.004**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.002)	(0.002)
Groundnut area	0.015**	0.278***	0.268***	0.015**	0.278***	0.268***
	(0.007)	(0.055)	(0.051)	(0.007)	(0.055)	(0.051)
Off-farm income	-0.044	-0.129	-0.098	-0.044	-0.129	-0.098
	(0.030)	(0.212)	(0.198)	(0.030)	(0.212)	(0.198)
Dependency ratio	-0.012	-0.075	-0.067	-0.012	-0.075	-0.067
	(0.008)	(0.047)	(0.043)	(0.008)	(0.047)	(0.043)
Clay soil	-0.016	-0.174	-0.167	-0.016	-0.174	-0.167
•	(0.032)	(0.202)	(0.184)	(0.032)	(0.202)	(0.184)
Sandy-clay soil	0.004	0.027	0.024	0.004	0.027	0.024
-	(0.024)	(0.150)	(0.137)	(0.024)	(0.150)	(0.137)
Silty soil	0.003	-0.063	-0.069	0.003	-0.063	-0.069
J. 1991	(0.032)	(0.199)	(0.181)	(0.032)	(0.199)	(0.181)
Observations	5,418	5,418	5,418	5,418	5,418	5,418
R-squared	0.092	0.129	0.156	0.092	0.129	0.156
Robust standard errors in parentheses						