

Different extension system typologies promote climate-smart agriculture in West Africa

Supplementary Material

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Table SM1: Descriptive plot: Distribution of extension systems by year

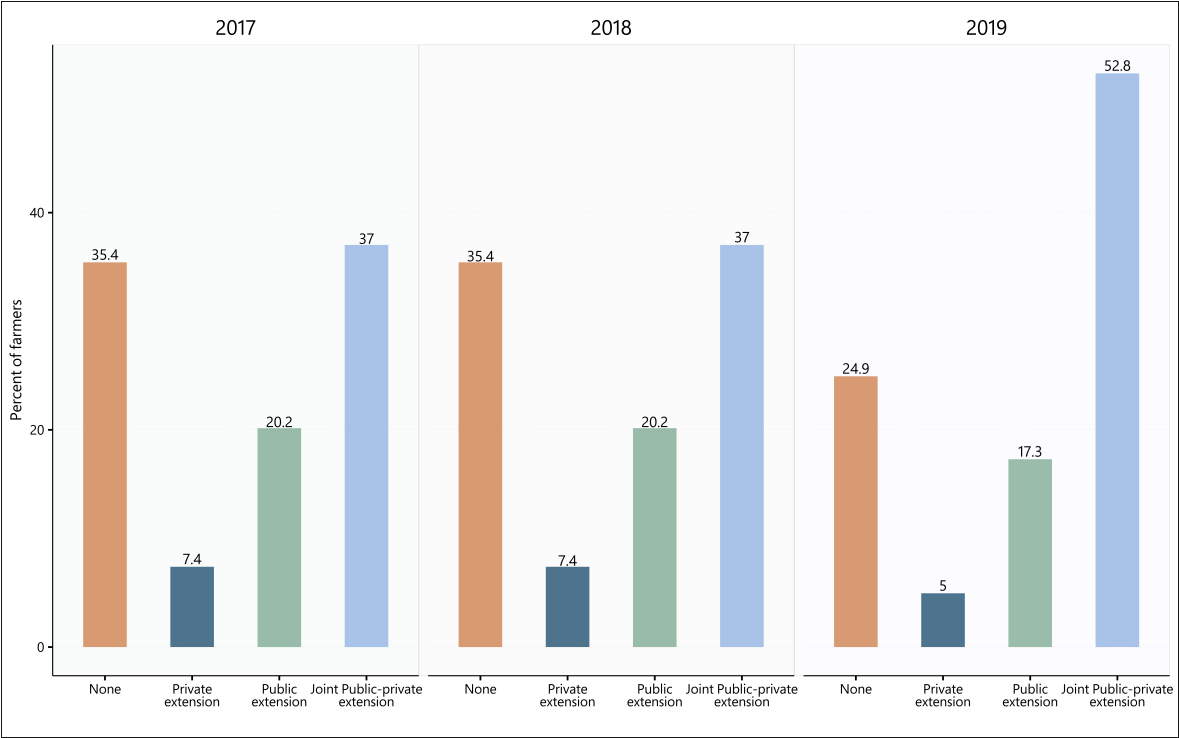


Table SM2: Correlation between CSA practises by country

Variable1	Variable2	Coefficient	Robust std. err.	Z	P > Z	[95% conf. interval]	
Overall							
Crop rotation	Improved seeds	-0.049	0.048	-1.02	0.31	-0.143	0.045
Crop rotation	Intercropping	0.348	0.104	3.33	0.001	0.143	0.552
Crop rotation	Organic fertilizer	0.168	0.084	1.99	0.046	0.003	0.332
Improved seeds	Intercropping	-0.136	0.041	-3.33	0.001	-0.216	-0.056
Improved seeds	Organic fertilizer	0.141	0.079	1.79	0.074	-0.014	0.296
Intercropping	Organic fertilizer	0.294	0.083	3.55	0	0.132	0.457
Ghana							
Crop rotation	Improved seeds	-0.043	0.08	-0.53	0.595	-0.2	0.114
Crop rotation	Intercropping	0.029	0.213	0.14	0.891	-0.389	0.447
Crop rotation	Organic fertilizer	0.034	0.098	0.35	0.724	-0.157	0.226
Improved seeds	Intercropping	-0.237	0.044	-5.42	0	-0.323	-0.152
Improved seeds	Organic fertilizer	0.047	0.09	0.52	0.604	-0.13	0.223
Intercropping	Organic fertilizer	0.138	0.055	2.52	0.012	0.031	0.246
Mali							
Crop rotation	Improved seeds	0.026	0.154	0.17	0.865	-0.276	0.328
Crop rotation	Intercropping	0.271	0.119	2.27	0.023	0.037	0.505
Crop rotation	Organic fertilizer	0.494	0.044	11.34	0	0.409	0.58
Improved seeds	Intercropping	-0.045	0.068	-0.66	0.506	-0.179	0.088
Improved seeds	Organic fertilizer	0.24	0.064	3.73	0	0.114	0.366
Intercropping	Organic fertilizer	-0.492	0.287	-1.72	0.086	-1.053	0.07
Nigeria							
Crop rotation	Improved seeds	-0.07	0.055	-1.27	0.204	-0.177	0.038
Crop rotation	Intercropping	0.604	0.117	5.18	0	0.375	0.832
Crop rotation	Organic fertilizer	0.205	0.107	1.92	0.055	-0.005	0.415
Improved seeds	Intercropping	-0.123	0.05	-2.44	0.015	-0.221	-0.024
Improved seeds	Organic fertilizer	0.141	0.1	1.41	0.158	-0.054	0.336
Intercropping	Organic fertilizer	0.369	0.084	4.39	0	0.204	0.533

Table SM3: Access to extension services and CSA - (CRE)

Variables	Crop rotation	Improved seeds	Intercropping	Organic fertilisers
Private extension	-0.0118 (0.195)	0.277 (0.231)	0.343*** (0.133)	-0.149 (0.391)
Public extension	0.178* (0.104)	0.0161 (0.161)	0.378** (0.150)	0.00671 (0.129)
Joint Public-private extension	0.284** (0.127)	0.842*** (0.222)	0.253 (0.154)	0.295 (0.191)
Age of household head (years)	0.0139 (0.0812)	-0.00917 (0.0957)	0.0625 (0.0809)	-0.0953 (0.0919)
Sex of household head (dummy, male=1)	0.133 (0.119)	0.209* (0.111)	-0.0630 (0.111)	-0.0245 (0.247)
Education level (Number of years)	-0.00311 (0.00905)	0.0112* (0.00676)	-0.00896 (0.0106)	-0.00210 (0.00617)
Household size (number of persons)	0.00605 (0.00649)	-0.0113 (0.0102)	0.0214*** (0.00674)	-0.0240** (0.0107)
Distance to the nearest urban market (km)	0.00943** (0.00419)	-0.00599 (0.00730)	0.000657 (0.00533)	0.00240 (0.00614)
Distance the nearest village market (km)	-0.0206** (0.00896)	0.00989 (0.00997)	-0.0219** (0.0107)	-0.0263 (0.0166)
Cooperative membership (dummy)	0.0819 (0.108)	-0.00866 (0.0783)	-0.0605 (0.132)	0.130 (0.114)
Labor cost (USD/ha)	0.000652 (0.00160)	0.00373*** (0.00139)	0.000473 (0.00136)	0.00685*** (0.00207)
Groundnut area (ha)	0.158*** (0.0506)	0.0378 (0.0326)	0.0684* (0.0379)	0.223*** (0.0848)
Off-farm income (dummy)	0.00842 (0.154)	0.220 (0.225)	0.0102 (0.154)	-0.341 (0.256)
Dependency ratio	-0.00586 (0.0227)	-0.0215 (0.0318)	0.0515** (0.0236)	0.0832** (0.0353)
Clay soil (dummy)	0.136*** (0.0526)	-0.00972 (0.0526)	0.0280 (0.0533)	0.0604 (0.0854)
Sandy-clay soil (dummy)	0.113* (0.0593)	0.000136 (0.0561)	0.0290 (0.0396)	0.119** (0.0570)
Silty soil (dummy)	0.169** (0.0666)	-0.00204 (0.0673)	-0.0224 (0.0509)	0.0321 (0.0817)
agebar	-0.0164 (0.0811)	0.00874 (0.0951)	-0.0603 (0.0806)	0.0964 (0.0916)
hhsizerbar	-0.00718 (0.00980)	0.0137 (0.0120)	-0.0255*** (0.00834)	0.0103 (0.0115)
gsizerbar	-0.0476 (0.0479)	0.0904*** (0.0324)	-0.0266 (0.0352)	-0.0915 (0.0739)
off_farmbar	0.0512 (0.178)	-0.166 (0.163)	0.0508 (0.155)	0.272 (0.281)
dratiobar	0.00862 (0.0250)	0.0313 (0.0365)	-0.0458 (0.0286)	-0.0435 (0.0394)
Constant	-1.845*** (0.188)	-0.500* (0.272)	-0.290 (0.259)	-1.264*** (0.436)
Observations	8,604	8,604	8,604	8,604
Additional controls	Yes	Yes	Yes	Yes
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 SM4: Access to extension services and CSA - (CRE) (Ghana)

Variables	Crop rotation	Improved seeds	Intercropping	Organic fertilisers
Private extension	-0.909* (0.540)		-1.042** (0.447)	0.936*** (0.100)
Public extension	-0.134 (0.175)	1.180*** (0.425)	-0.0590 (0.226)	0.0992 (0.266)
Joint Public-private extension	0.0418 (0.148)	2.336*** (0.379)	-0.0913 (0.263)	
Age of household head (years)	-0.267 (0.172)	-0.202 (0.165)	0.103 (0.197)	-0.107 (0.180)
Sex of household head (dummy, male=1)	0.0430 (0.146)	0.166 (0.191)	-0.314** (0.149)	0.332 (0.258)
Education level (Number of years)	-0.0103 (0.0185)	0.0337** (0.0143)	0.0192* (0.0115)	-0.0196 (0.0141)
Household size (number of persons)	-0.0200 (0.0345)	0.0176 (0.0179)	-0.0303 (0.0198)	0.0701*** (0.0199)
Distance to the nearest urban market (km)	-0.0319 (0.0259)	0.00251 (0.0153)	0.0254 (0.0205)	0.180*** (0.0551)
Distance the nearest village market (km)	-0.0168 (0.0204)	-0.0197 (0.0248)	-0.0393 (0.0330)	-0.113*** (0.0417)
Cooperative membership (dummy)	0.518*** (0.193)	0.241 (0.184)	0.0564 (0.208)	0.454 (0.301)
Labor cost (USD/ha)	0.00312 (0.00226)	0.0111*** (0.00228)	0.000712 (0.00199)	0.00175 (0.00125)
Groundnut area (ha)	0.333** (0.139)	0.0419 (0.0675)	-0.0511 (0.105)	0.528*** (0.0859)
Off-farm income (dummy)	0.519 (0.733)	-0.431 (0.334)	0.712*** (0.169)	1.961*** (0.282)
Dependency ratio	0.0903* (0.0547)	-0.00890 (0.0514)	0.0111 (0.0890)	0.0252 (0.116)
Clay soil (dummy)	0.245** (0.105)	-0.00160 (0.0822)	-0.0609 (0.118)	0.532*** (0.161)
Sandy-clay soil (dummy)	0.224*** (0.0869)	0.133 (0.0908)	-0.0752 (0.116)	0.613*** (0.213)
Silty soil (dummy)	0.365** (0.184)	0.106 (0.0907)	-0.182 (0.206)	0.243 (0.156)
agebar	0.255 (0.171)	0.195 (0.163)	-0.0964 (0.197)	0.0791 (0.183)
hhsizerbar	0.0325 (0.0475)	0.00467 (0.0259)	0.0166 (0.0164)	0.0692** (0.0281)
gsizerbar	-0.0298 (0.0881)	0.0171 (0.0721)	-0.0412 (0.123)	0.239 (0.162)
off_farmbar	-0.154 (0.612)	0.564 (0.389)	-0.345 (0.448)	-2.104*** (0.449)
dratiobar	-0.0672 (0.0700)	-0.0701 (0.0903)	-0.0718 (0.0825)	0.0361 (0.163)
Constant	0.390 (0.504)	-1.844*** (0.426)	-0.547 (0.347)	-6.351*** (1.081)
Observations	1,494	1,494	1,494	1,494
Additional controls	Yes	Yes	Yes	Yes
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 SM5: Access to extension services and CSA - (CRE) (Mali)

Variables	Crop rotation	Improved seeds	Intercropping	Organic fertilisers
Private extension	0.0116 (0.299)	0.0223 (0.274)	0.385*** (0.122)	-0.0803 (0.115)
Public extension	0.580*** (0.167)	0.159 (0.394)	0.356 (0.264)	-0.689*** (0.170)
Joint Public-private extension	0.192 (0.255)	1.610*** (0.335)	0.408* (0.240)	0.312** (0.133)
Age of household head (years)	0.134 (0.119)	-0.164** (0.0664)	0.0618 (0.133)	-0.126 (0.124)
Sex of household head (dummy, male=1)	0.117 (0.223)	0.157 (0.212)	0.179 (0.128)	-0.305 (0.192)
Education level (Number of years)	0.0596*** (0.0173)	0.0656*** (0.0150)	-0.0487*** (0.0158)	-0.0127 (0.0241)
Household size (number of persons)	0.0116** (0.00521)	-0.00707 (0.00722)	0.0263*** (0.00713)	-0.00501 (0.0137)
Distance to the nearest urban market (km)	0.00990** (0.00473)	0.00278 (0.00771)	0.00178 (0.0147)	-0.00661*** (0.00188)
Distance the nearest village market (km)	-0.0178 (0.0119)	0.0151 (0.0121)	-0.0234** (0.0112)	-0.0230 (0.0176)
Cooperative membership (dummy)	-0.0768 (0.183)	-0.0613 (0.104)	-0.441*** (0.136)	0.113 (0.143)
Labor cost (USD/ha)	0.00196 (0.00357)	0.00224 (0.00238)	-0.00125 (0.00301)	-0.00349 (0.00272)
Groundnut area (ha)	0.127*** (0.0440)	0.0146 (0.0142)	0.00203 (0.0280)	0.00461 (0.0605)
Off-farm income (dummy)	0.191 (0.432)	-0.363* (0.212)	1.044*** (0.324)	0.797* (0.436)
Dependency ratio	-0.00222 (0.0909)	-0.0334 (0.0403)	0.0436 (0.0581)	0.0316 (0.0467)
Clay soil (dummy)	0.0780 (0.115)	-0.0710 (0.105)	0.0548 (0.123)	-0.188 (0.118)
Sandy-clay soil (dummy)	-0.0568 (0.132)	-0.0963 (0.0760)	-0.0104 (0.0937)	0.0110 (0.128)
Silty soil (dummy)	0.234** (0.111)	-0.141 (0.158)	-0.0434 (0.0848)	-0.0106 (0.182)
agebar	-0.141 (0.117)	0.168** (0.0681)	-0.0584 (0.134)	0.125 (0.124)
hhszebar	-0.0165* (0.00954)	0.0162 (0.00992)	-0.0316*** (0.00801)	-0.00359 (0.0157)
gszebar	0.0215 (0.0341)	0.0866** (0.0361)	-0.0406 (0.0388)	0.00398 (0.0871)
off_farmbar	-0.424 (0.628)	-0.0412 (0.322)	-0.378 (0.885)	-0.0192 (0.641)
dratiobar	0.0138 (0.0561)	-0.0309 (0.0707)	-0.0735 (0.0856)	0.0217 (0.0898)
Constant	1.690*** (0.369)	-2.743*** (0.565)	-0.464 (0.434)	-0.619** (0.269)
Observations	2,520	2,520	2,520	2,520
Additional controls	Yes	Yes	Yes	Yes
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 SM6: Access to extension services and CSA - (CRE) (Nigeria)

Variables	Crop rotation	Improved seeds	Intercropping	Organic fertilisers
Private extension	0.152 (0.312)	0.717*** (0.265)	0.519* (0.273)	-0.207 (0.425)
Public extension	0.0638 (0.146)	0.0660 (0.172)	0.471* (0.242)	0.218 (0.166)
Joint Public-private extension	0.455*** (0.152)	0.471* (0.242)	0.184 (0.174)	0.0353 (0.246)
Age of household head (years)	0.0698 (0.0966)	0.0664 (0.142)	0.0664 (0.113)	-0.000880 (0.110)
Sex of household head (dummy, male=1)	0.420* (0.230)	-0.0769 (0.133)	0.207 (0.242)	0.111 (0.267)
Education level (Number of years)	-0.0110 (0.0126)	-0.00321 (0.00649)	-0.0126 (0.0137)	-0.00915 (0.00637)
Household size (number of persons)	-0.00181 (0.0114)	-0.0142 (0.0195)	0.0178 (0.0126)	-0.0454** (0.0208)
Distance to the nearest urban market (km)	0.0108** (0.00469)	-0.00853 (0.00985)	-0.00109 (0.00487)	0.00379 (0.00756)
Distance the nearest village market (km)	-0.0494* (0.0277)	0.0270 (0.0303)	-0.00474 (0.0338)	-0.00224 (0.0306)
Cooperative membership (dummy)	-0.0130 (0.105)	0.0321 (0.0821)	0.149 (0.243)	0.103 (0.140)
Labor cost (USD/ha)	-0.000566 (0.00187)	0.00300 (0.00186)	0.00110 (0.00181)	0.0171*** (0.00440)
Groundnut area (ha)	0.0800 (0.0489)	0.0742 (0.0629)	0.176*** (0.0605)	0.551*** (0.126)
Off-farm income (dummy)	-0.0387 (0.127)	0.176 (0.221)	-0.109 (0.161)	-0.487* (0.284)
Dependency ratio	-0.0182 (0.0223)	-0.0155 (0.0425)	0.0715** (0.0279)	0.0757 (0.0473)
Clay soil (dummy)	0.122 (0.0770)	0.0296 (0.0812)	0.0820 (0.0634)	0.147 (0.0937)
Sandy-clay soil (dummy)	0.164*** (0.0612)	0.0253 (0.0834)	0.0884** (0.0352)	0.133** (0.0533)
Silty soil (dummy)	0.0534 (0.0889)	0.0490 (0.0874)	0.0414 (0.0514)	-0.00442 (0.0735)
agebar	-0.0648 (0.0964)	-0.0649 (0.141)	-0.0681 (0.112)	0.00229 (0.110)
hhsiebar	-0.00656 (0.0209)	-0.00412 (0.0246)	-0.0129 (0.0168)	0.0321 (0.0257)
gsizebar	-0.0295 (0.0601)	0.101* (0.0613)	0.0115 (0.0498)	-0.157* (0.0931)
off_farmbar	0.125 (0.163)	-0.124 (0.168)	0.101 (0.168)	0.272 (0.283)
dratiobar	0.0206 (0.0334)	0.0547 (0.0467)	-0.0483 (0.0294)	-0.0355 (0.0380)
Constant	-2.022*** (0.364)	-0.128 (0.409)	-1.063** (0.486)	0.387 (0.370)
Observations	4,590	4,590	4,590	4,590
Additional controls	Yes	Yes	Yes	Yes
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 SM7: Attrition bias check

Variables	Overall	Ghana	Mali	Nigeria
Sex of household head	0.0597 (0.159)	0.0348 (0.234)	0.133 (0.339)	0.191 (0.433)
Age of household head (years)	0.00488 (0.00397)	-0.00385 (0.00996)	0.00724 (0.00618)	0.00255 (0.00687)
Number of years at school without repetition	-0.00311 (0.00997)	-0.0114 (0.0241)	-0.00182 (0.0272)	0.0124 (0.0131)
Number of years in groundnut production as independent household head	-0.00214 (0.00423)	0.00415 (0.0114)	-0.00854 (0.00673)	0.00380 (0.00713)
Number of people in the household	0.000260 (0.00438)	0.0112 (0.0190)	-0.00362 (0.00625)	-0.00254 (0.0120)
dependency ratio	-0.0379 (0.0286)	-0.0422 (0.0732)	0.0500 (0.0579)	-0.0526 (0.0398)
Have you or other members of your household received cash credit for groundnut d	0.266 (0.165)	0.352 (0.600)	0.337 (0.226)	0.0955 (0.294)
Have you or other members of your household received credit in kind for groundnu	-0.117 (0.146)		0.173 (0.237)	-0.0908 (0.204)
Log household distance to urban market	0.0412 (0.0393)	0.0655 (0.160)	0.115* (0.0626)	-0.0110 (0.0589)
off-farm income	-0.148 (0.128)		0.391 (0.347)	-0.0495 (0.149)
Constant	-1.850*** (0.249)	-1.497*** (0.576)	-2.194*** (0.462)	-1.988*** (0.551)
Observations	3,040	517	900	1,600
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1				