# Supporting Information for:

## Smallholder Farmers and Contract Farming in Developing Countries

Authors: Eva-Marie Meemken and Marc F. Bellemare

Corresponding author: Eva-Marie Meemken (emm253@cornell.edu)

**This PDF file includes:**

1. Robustness checks
2. Figs. S1 to S4
3. Tables S1 to S22

www.pnas.org/cgi/doi/10.1073/pnas.1909501116

## 1. Robustness checks

### Contract farming and income

We estimate income differences between households that participate and those that do not participate in contract farming, focusing on the logarithm of total income per capita and day (see equation 1 in the Manuscript). As a robustness check, we consider a range of alternative specifications, including total monthly household income, median regressions (to reduce the influence of outliers), and poverty levels (estimated via linear probability models). Results are displayed in the SI Appendix, Table S4-S6.

Following the World Bank definition,[1] we classify households as poor if their household income per capita and day is below US$1.90 PPP (2016). For this purpose, we used country-specific values provided by the International Comparison Program (ICP).

### Contract farming and labor demand

In analyzing the relationship between contract farming and labor demand (equation 2 in the Manuscript), our treatment variable indicates whether (at least 1 household member of) household j participates in contract farming. In alternative specifications, our treatment variable measures the intensity of participation in contract farming (i.e., it captures the share of adult household members involved in contract farming). Results of this robustness check can be found in the SI Appendix, Table S13.

### Spillover effects

To estimate income effects on non-participating households (see equation 5 in the Manuscript), our treatment variable, $S$, is the proportion of contract farmers in each cluster $c$. In alternative specifications, $S$ is a dummy variable indicating whether at least one household in cluster $c$ participates in contract farming. Results are displayed in the SI Appendix, Table S18.

As a robustness check, we also estimate equation (5) considering the share of contract farmers in each administrative unit (instead of the share of contract farmers in each cluster). Results are displayed in the SI Appendix, Table S19.

The prevalence of contract farming may affect non-participants and communities through several pathways. As outlined in the introduction, we suggest that increased labor demand among participants (see above) may be one important channel. As a robustness check, we estimate (5) focusing only on the subsample of households that actually participate in the labor markets or that have particularly small landholdings. Results are displayed in the SI Appendix, Table S20.

[1] See: https://www.worldbank.org/en/programs/icp/brief/poverty-line

**Further robustness checks**

All of our regressions (equation 1-5) include land ownership as a control variable. It is possible that this variable suffers from revere causality (i.e., households may buy more land as a result of participating in contract farming). Table S21 displays an overview of regression results, where we exclude this potentially endogenous variable. Since wealthier farmers with larger landholdings are commonly found to be more likely to participate in contract farming, we keep this control variable in the main regressions.

As an additional robustness check, we also employ an alternative approach to address possible selection bias—that is, the possibility that there may be unobserved characteristics that simultaneously effect (1) the likelihood of locations and households to participate in contract farming and (2) our outcomes of interest. For this purpose, we use an instrumental variable approach. Our instrument—the share of contract farmers in each location—is highly correlated with households' likelihood to participate in contract farming, but plausibly exogenous to our outcomes of interest. Results are shown in the SI Appendix, Table S22 and do not change our main results or conclusions.

Our definition of contract farming captures a wide range of contractual arrangements, involving different products, buyers, pricing policies, degrees of formality, and services attached. In turn, most available studies focus on large, export-oriented contract schemes operated by private companies. As a robustness check, we thus consider an alternative definition of contract farming. For this purpose, we generate a dummy variable which includes information from three different variables. This new treatment variable is coded as one if (1) a farmer has a contract, and (2) sells products to wholesalers or processors, and (3) obtains agricultural inputs from these buyers. Households are defined as contract households if (1)-(3) hold for at least one household member. Tables displaying all regression outputs using this alternative definition of contract farming can be found in the SI Appendix (Tables S7-S10). Participation rates (especially for Tanzania) are much lower using this alternative definition (S7), which was expected. Since the treatment groups become quite small for some countries, we also estimate median regressions (Table S9) and regressions excluding outliers (Table S10) to rule out the possibility that results are driven by outliers. This alternative definition does not change results much in terms of the magnitude of effect sizes as well as levels of significance when looking at the total sample. The same holds for country-level results for Bangladesh, Nigeria, and Uganda. In turn, we find that income differences become larger and significant in Cote d'Ivoire and Tanzania; and smaller in Mozambique. This suggests that contract with large more formal buyers (even when they offer inputs) are not necessarily more beneficial for farm households than other types of (possibly less informal) contracts.

## 2. Supplementary Figures

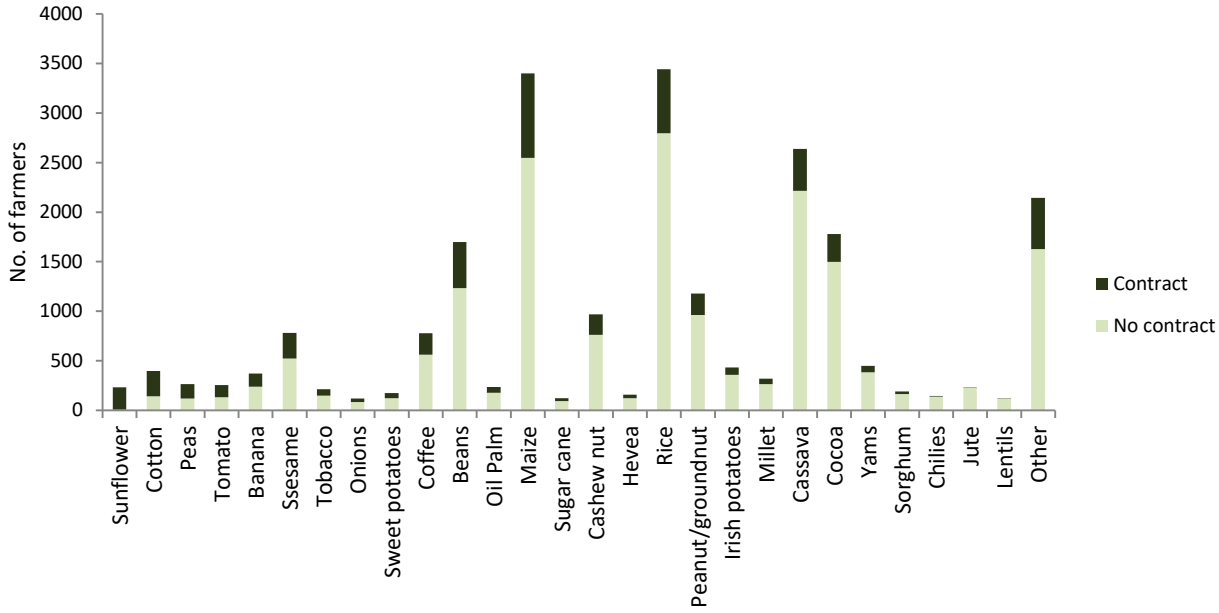


**Figure S1: Most important crops grown by farmers.** Farmers typically grow several crops. Here, we consider the most important crop in terms of income (self-reported). The contract status refers to the farmer, not the crop. Crops are ordered (moving from the right-hand side to the left-hand side) according to the proportion of farmers who have a contract and mention the respective crop as the most important crop. N=23,256. Values are missing for 4,505 individuals who were unable to name a single crop.

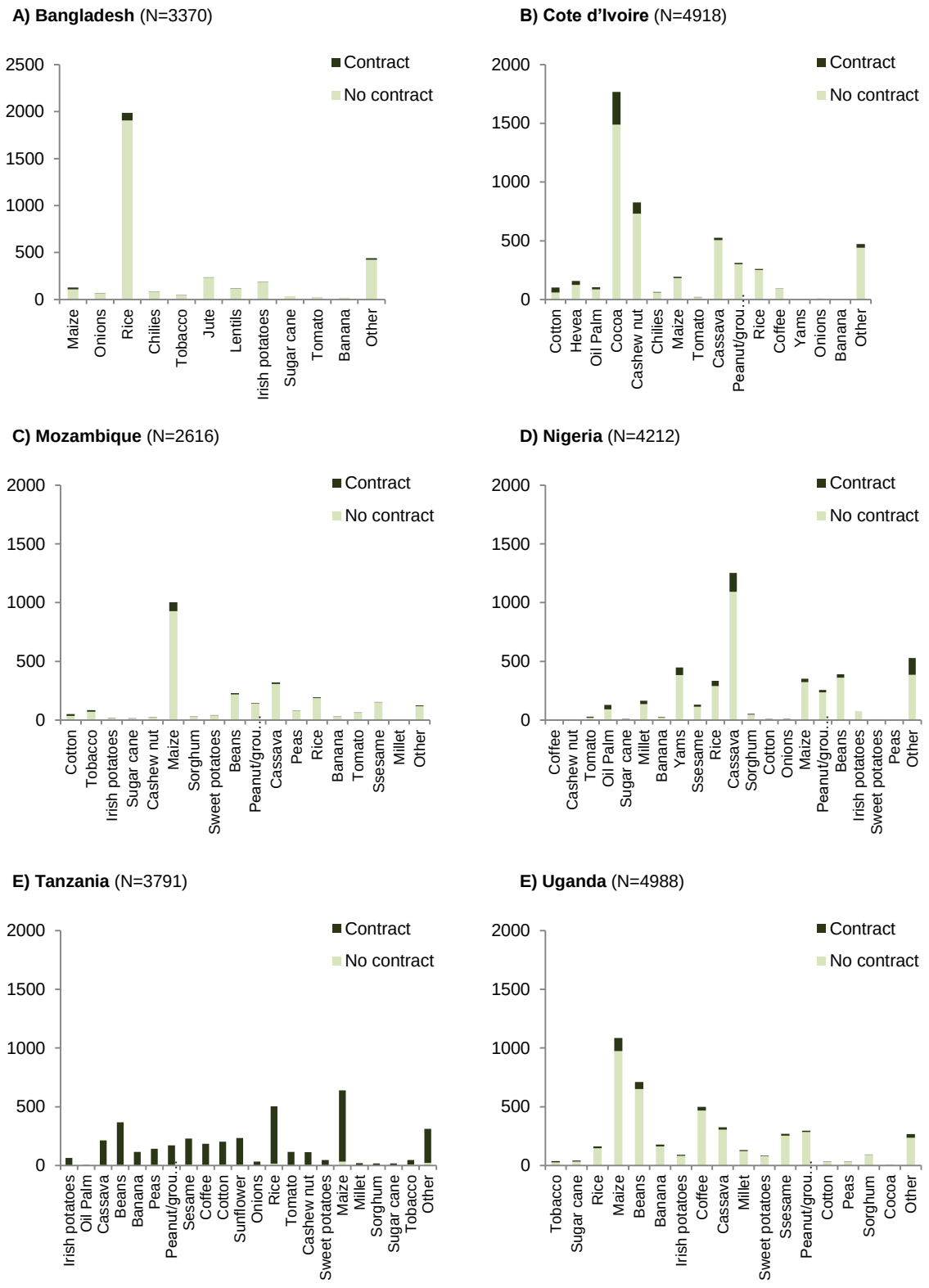


**Figure S2: Most important crops grown by farmers.** Farmers may grow several crops. Here, the most important crop in terms of income (self-reported) are shown. On the Y-Axis: No. of farmer mentioning the respective crop as the most important crop. The contract status referrers to farmers, not the crop.

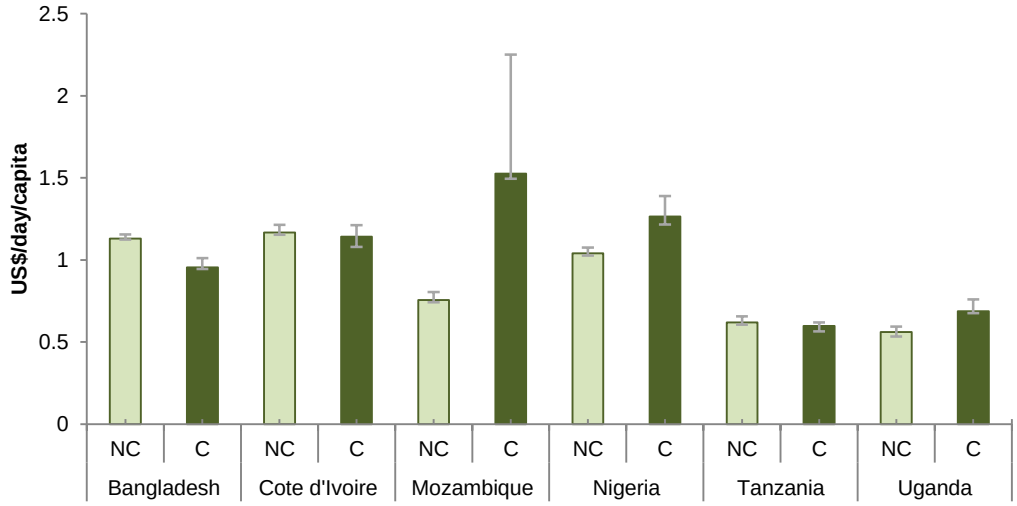


**Figure S3: Income per day and capita in US$ by country and contract status.** Means are estimated using sampling weights. Standard errors are shown. NC: No contract, C: Contract. All figures refer to the household level.

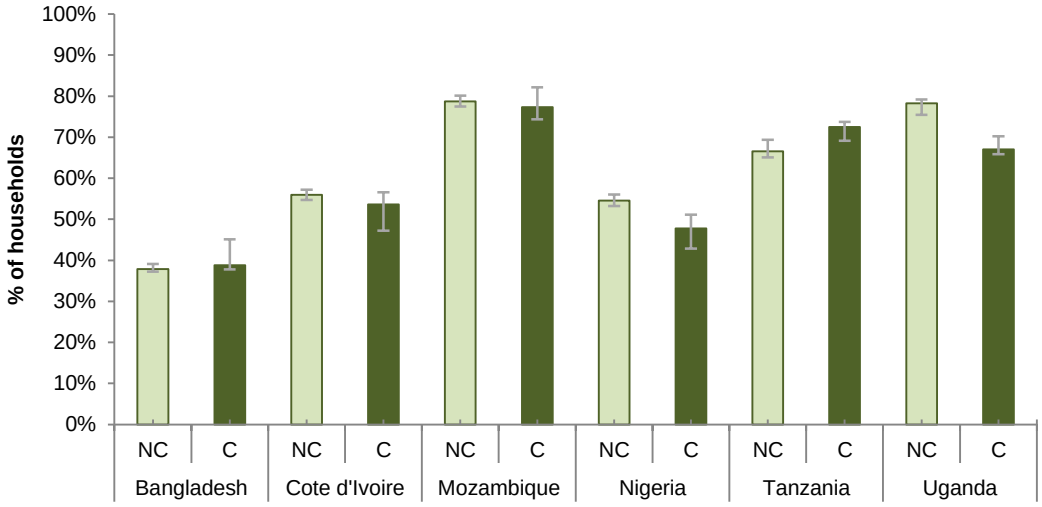


**Figure S4: Proportion of households below the international poverty line (US$1.90 PPP) by country and contract status.** Proportions are estimated using sampling weights. Standard errors are shown. NC: No contract, C: Contract. All figures refer to the household level.

## 3. Supplementary Tables

**Table S1: Correlates of participation in contract farming at the household level**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| Female headed household (0/1) | -0.025*** | -0.029*** | -0.032*** |
| | (0.005) | (0.007) | (0.007) |
| Age of household head (yrs.) | -0.000 | -0.000** | -0.000** |
| | (0.000) | (0.000) | (0.000) |
| Household head ever attended school (0/1) | 0.003 | -0.000 | -0.004 |
| | (0.009) | (0.006) | (0.006) |
| No. of household members | 0.001 | 0.002 | 0.002* |
| | (0.001) | (0.001) | (0.001) |
| Number of crops grown by household | 0.006* | 0.007*** | 0.007*** |
| | (0.003) | (0.001) | (0.001) |
| Household has livestock (0/1) | 0.013*** | 0.022*** | 0.025*** |
| | (0.002) | (0.006) | (0.006) |
| Land owned by household (ha) | 0.003*** | 0.003*** | 0.002*** |
| | (0.001) | (0.001) | (0.001) |
| At least one household member buys inputs (0/1) | 0.067* | 0.052*** | 0.049*** |
| | (0.026) | (0.010) | (0.009) |
| At least one member sells wholesaler or processor (0/1) | 0.076* | 0.073*** | 0.075*** |
| | (0.033) | (0.009) | (0.009) |
| Rural (0/1) | 0.026 | 0.028* | 0.021 |
| | (0.026) | (0.015) | (0.124) |
| Constant | 0.073 | 0.081*** | 0.087 |
| | (0.052) | (0.021) | (0.106) |
| Observations | 16,140 | 16,140 | 16,140 |

Linear Probability models (1=household has a contract). All variables refer to the household level. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table S2: Correlates of participation in contract farming at the individual level**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE | (4) Household FE |
|---|---|---|---|---|
| Household head (0/1) | 0.009* | 0.009* | 0.007 | 0.001 |
| | (0.004) | (0.004) | (0.005) | (0.007) |
| Female (0/1) | -0.017* | -0.017* | -0.020*** | -0.018*** |
| | (0.008) | (0.008) | (0.005) | (0.006) |
| Age (yrs.) | -0.000 | -0.000 | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Any schooling (0/1) | 0.002 | 0.002 | -0.001 | -0.000 |
| | (0.006) | (0.006) | (0.005) | (0.006) |
| No. of crops grown | 0.006* | 0.006* | 0.007*** | 0.004*** |
| | (0.002) | (0.002) | (0.001) | (0.001) |
| Owns livestock | 0.019*** | 0.019*** | 0.031*** | 0.031*** |
| | (0.005) | (0.005) | (0.005) | (0.006) |
| Buys inputs (0/1) | 0.063* | 0.063* | 0.048*** | 0.043*** |
| | (0.027) | (0.027) | (0.007) | (0.009) |
| Primary job farming (0/1) | 0.022 | 0.022 | 0.023*** | 0.010 |
| | (0.033) | (0.033) | (0.007) | (0.006) |
| Sells to wholesaler or processor (0/1) | 0.066 | 0.066 | 0.065*** | 0.035*** |
| | (0.033) | (0.033) | (0.008) | (0.009) |
| Constant | 0.076 | 0.076 | 0.084*** | 0.100*** |
| | (0.052) | (0.052) | (0.012) | (0.014) |
| Observations | 27,761 | 27761 | 27,761 | 27,761 |

Linear probability models (1=Individual has a contract). All variables refer to the individual level. Standard errors clustered at the country level (1), administrative unit level (2), cluster level (3), or household level (4) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table S3: Contract farming and income (log of household income per capita and day)**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| Contract household (0/1) | 0.140** | 0.116*** | 0.095*** |
| | (0.044) | (0.031) | (0.026) |
| Female headed households (0/1) | -0.161*** | -0.186*** | -0.188*** |
| | (0.039) | (0.025) | (0.023) |
| Age of household head (yrs.) | 0.001 | -0.000 | -0.000 |
| | (0.002) | (0.001) | (0.001) |
| Household head ever attended school (0/1) | 0.238*** | 0.170*** | 0.147*** |
| | (0.049) | (0.018) | (0.018) |
| No. of household members | -0.150*** | -0.142*** | -0.140*** |
| | (0.005) | (0.004) | (0.004) |
| Land owned (ha) by household | 0.012*** | 0.012*** | 0.012*** |
| | (0.002) | (0.002) | (0.002) |
| Rural (0/1) | -0.486*** | -0.472*** | -0.436 |
| | (0.116) | (0.060) | (0.345) |
| Constant | 0.288 | 0.365*** | 0.344 |
| | (0.155) | (0.061) | (0.294) |
| Observations | 14,573 | 14,573 | 14,573 |

The log of household income per capita and day is regressed on participation in contract farming (0/1). All variables refer to the household level. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S4: Contract farming and income (log of total monthly household income), overview of country-level regressions**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| All countries (N=14,573) | 0.144** | 0.124*** | 0.104*** |
| | (0.046) | (0.030) | (0.026) |
| Bangladesh (N=2,677) | | -0.023 | 0.031 |
| | | (0.070) | (0.051) |
| Côte d'Ivoire (N=2,686) | | 0.138** | 0.091* |
| | | (0.057) | (0.052) |
| Mozambique (N=1,443) | | 0.350* | 0.265* |
| | | (0.184) | (0.137) |
| Nigeria (N=2,604) | | -0.010 | -0.012 |
| | | (0.049) | (0.050) |
| Tanzania (N=2,621) | | 0.089 | 0.087* |
| | | (0.055) | (0.051) |
| Uganda (N=2,542) | | 0.299*** | 0.267*** |
| | | (0.091) | (0.078) |

This table provides an overview of regression results by country. The log of total monthly household income is regressed on participation in contract farming (0/1). Control variables are equivalent to those in Table S3. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S5: Contract farming and income (log of household income per capita and day), overview of country-level median regressions**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| All countries (N=14,573) | 0.139*** | 0.116*** | 0.095*** |
| | (0.024) | (0.024) | (0.023) |
| Bangladesh (N=2,677) | | -0.040 | 0.007 |
| | | (0.050) | (0.046) |
| Côte d'Ivoire (N=2,686) | | 0.119*** | 0.077* |
| | | (0.044) | (0.044) |
| Mozambique (N=1,443) | | 0.344*** | 0.268*** |
| | | (0.093) | (0.102) |
| Nigeria (N=2,604) | | 0.006 | 0.005 |
| | | (0.043) | (0.043) |
| Tanzania (N=2,621) | | 0.079 | 0.070 |
| | | (0.049) | (0.050) |
| Uganda (N=2,542) | | 0.285*** | 0.251*** |
| | | (0.073) | (0.071) |

This table provides an overview of median regression results by country. The log of household income per capita and day is regressed on participation in contract farming (0/1). Control variables are equivalent to those in Table S3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S6: Contract farming and poverty, overview of country-level regressions**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| All countries (N=14,573) | -0.058* | -0.048*** | -0.042*** |
| | (0.026) | (0.013) | (0.013) |
| Bangladesh (N=2,677) | | 0.041 | 0.006 |
| | | (0.050) | (0.045) |
| Côte d'Ivoire (N=2,686) | | -0.060* | -0.043 |
| | | (0.033) | (0.030) |
| Mozambique (N=1,443) | | -0.060 | -0.040 |
| | | (0.042) | (0.055) |
| Nigeria (N=2,604) | | -0.054** | -0.053** |
| | | (0.025) | (0.025) |
| Tanzania (N=2,621) | | -0.021 | -0.011 |
| | | (0.024) | (0.025) |
| Uganda (N=2,542) | | -0.102*** | -0.090*** |
| | | (0.032) | (0.029) |

This table provides an overview of regression results by country. A dummy variable, which is coded as one if household income per capita and day is below $1.90 PPP, is regressed on participation in contract farming (0/1). Linear probability models are estimated .Control variables are equivalent to those in Table S3. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S7: Overview of sample households and individuals by contract status and country, alternative definition of contract farming**

| | Household level | | | Individual level | | |
|---|---|---|---|---|---|---|
| | All households | No contract | Contract | All individuals | No contract | Contract |
| Bangladesh | 2,689 | 2,616 | 73 | 3,951 | 3,873 | 78 |
| Côte d'Ivoire | 2,912 | 2,884 | 28 | 5,354 | 5,321 | 33 |
| Mozambique | 2,331 | 2,292 | 39 | 3,979 | 3,935 | 44 |
| Nigeria | 2,737 | 2,592 | 145 | 4,532 | 4,329 | 203 |
| Tanzania | 2,706 | 2,535 | 171 | 4,742 | 4,510 | 232 |
| Uganda | 2,765 | 2,716 | 49 | 5,203 | 5,141 | 62 |
| Total sample | 16,140 | 15,635 | 505 | 27,761 | 27,109 | 652 |

Farmers and households are defined as contract farmers and households if they (1) participate in contract farming, (2) sell their products to wholesalers and/or processors, and (3) obtain inputs from these buyers.

**Table S8: Participation in contract farming (alternative definition) and household income, overview of country-level regressions**

| | (1)<br>Country FE | (2)<br>Admin. unit FE | (3)<br>Cluster FE |
|---|---|---|---|
| All countries (N=14,573) | 0.191** | 0.139*** | 0.120*** |
| | (0.073) | (0.050) | (0.045) |
| Bangladesh (N=2,677) | | -0.062 | -0.016 |
| | | (0.096) | (0.069) |
| Côte d'Ivoire (N=2,686) | | 0.375** | 0.403** |
| | | (0.179) | (0.166) |
| Mozambique (N=1,443) | | 0.375 | 0.091 |
| | | (0.229) | (0.194) |
| Nigeria (N=2,604) | | -0.023 | -0.016 |
| | | (0.084) | (0.081) |
| Tanzania (N=2,621) | | 0.148* | 0.148* |
| | | (0.079) | (0.082) |
| Uganda (N=2,542) | | 0.528*** | 0.480*** |
| | | (0.148) | (0.144) |

This table provides an overview of regression results by country. Control variables are equivalent to those in Table S3. The log of household income per capita and day is regressed on participation in contract farming (0/1). Households are defined as contract households if at least one household member (1) has a contract, (2) sells his/her products to wholesalers and/or processors, and (3) obtains inputs from these buyers. Standard errors clustered at the country level (column 1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table S9: Participation in contract farming (alternative definition) and household income, median effects, overview of country-level median regressions**

| | (1)<br>Country FE | (2)<br>Admin. unit FE | (3)<br>Cluster FE |
|---|---|---|---|
| All countries (N=14,573) | 0.190*** | 0.139*** | 0.120*** |
| | (0.040) | (0.040) | (0.039) |
| Bangladesh (N=2,677) | | -0.063 | -0.017 |
| | | (0.066) | (0.058) |
| Côte d'Ivoire (N=2,686) | | 0.375** | 0.403*** |
| | | (0.151) | (0.151) |
| Mozambique (N=1,443) | | 0.363*** | 0.091 |
| | | (0.140) | (0.155) |
| Nigeria (N=2,604) | | -0.024 | -0.017 |
| | | (0.069) | (0.068) |
| Tanzania (N=2,621) | | 0.146** | 0.149** |
| | | (0.072) | (0.073) |
| Uganda (N=2,542) | | 0.533*** | 0.480*** |
| | | (0.165) | (0.152) |

This table provides an overview of median regression results by country. The log of household income per capita and day is regressed on participation in contract farming (0/1). Households are defined as contract households if at least one household member (1) has a contract, (2) sells his/her products to wholesalers and/or processors, and (3) obtains inputs from these buyers. Control variables are equivalent to those in Table S3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S10: Participation in contract farming (alternative definition) and household income, overview of country-level regressions—excluding outliers (largest and smallest 1%)**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| All countries (14,218) | 0.191** | 0.139*** | 0.120*** |
| | (0.073) | (0.050) | (0.045) |
| Bangladesh (N=2,677) | | -0.062 | -0.016 |
| | | (0.096) | (0.069) |
| Côte d'Ivoire (N=2,686) | | 0.375** | 0.403** |
| | | (0.179) | (0.166) |
| Mozambique (N=1,443) | | 0.375 | 0.091 |
| | | (0.229) | (0.194) |
| Nigeria (N=2,604) | | -0.023 | -0.016 |
| | | (0.084) | (0.081) |
| Tanzania (N=2,621) | | 0.148* | 0.148* |
| | | (0.079) | (0.082) |
| Uganda (N= 2,542) | | 0.528*** | 0.480*** |
| | | (0.148) | (0.144) |

This table provides an overview of regression results by country. Control variables are equivalent to those in Table S3. The log of household income per capita and day is regressed on participation in contract farming (0/1). Households are defined as contract households if at least one household member (1) has a contract, (2) sells his/her products to wholesalers and/or processors, and (3) obtains inputs from these buyers. Standard errors clustered at the country level (column 1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table S11: Labor demand at the household level**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| Contract household (0/1) | 0.086*** | 0.080*** | 0.079*** |
| | (0.014) | (0.013) | (0.012) |
| Female household head (0/1) | -0.026 | -0.033*** | -0.032*** |
| | (0.020) | (0.009) | (0.008) |
| Age of household head | 0.001 | 0.000** | 0.001** |
| | (0.001) | (0.000) | (0.000) |
| Household head ever attended school (0/1) | 0.081** | 0.050*** | 0.045*** |
| | (0.026) | (0.009) | (0.007) |
| No. of household members | -0.000 | 0.001 | 0.002* |
| | (0.001) | (0.001) | (0.001) |
| Land owned (ha) by household | 0.004** | 0.004*** | 0.003*** |
| | (0.001) | (0.001) | (0.001) |
| Rural (0/1) | -0.052** | -0.074*** | -0.055* |
| | (0.019) | (0.023) | (0.032) |
| Constant | 0.147** | 0.196*** | 0.178*** |
| | (0.049) | (0.026) | (0.031) |
| Observations | 16,140 | 16,140 | 16,140 |

Linear probability models are estimated. A dummy variable, which is coded as one if the household hires labor for an extended period of time, is regressed on participation in contract farming (0/1). All variables refer to the household level. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S12: Labor demand at the household level, overview of country-level regressions**

| | (1) Admin. unit FE | (2) Cluster FE |
|---|---|---|
| Bangladesh (N=2,689) | 0.015 | -0.021 |
| | (0.036) | (0.029) |
| Côte d'Ivoire (N=2,912) | 0.071*** | 0.066*** |
| | (0.025) | (0.025) |
| Mozambique (N=2,331) | 0.170** | 0.169*** |
| | (0.063) | (0.047) |
| Nigeria (N=2,737) | 0.077** | 0.078** |
| | (0.031) | (0.031) |
| Tanzania (N=2,706) | 0.064*** | 0.065*** |
| | (0.017) | (0.019) |
| Uganda (N=2,765) | 0.107*** | 0.112*** |
| | (0.036) | (0.034) |

This table provides an overview of regression results by country. Linear probability models are estimated. A dummy variable, which is coded as one if the household hires labor for an extended period of time, is regressed on participation in contract farming (0/1). Control variables are equivalent to those in Table S11. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S13: Labor demand at the household level, intensity of contract farming**

| | (1) Country FE | (2) Admin. level 1 FE | (3) Cluster FE |
|---|---|---|---|
| Share of household members with contract | 0.103*** | 0.093*** | 0.091*** |
| | (0.020) | (0.015) | (0.014) |
| Female household head (0/1) | -0.027 | -0.034*** | -0.033*** |
| | (0.020) | (0.009) | (0.008) |
| Age of household head | 0.001 | 0.001** | 0.001** |
| | (0.001) | (0.000) | (0.000) |
| Household head ever attended school (0/1) | 0.080** | 0.050*** | 0.045*** |
| | (0.026) | (0.008) | (0.007) |
| No. of household members | 0.000 | 0.002 | 0.003** |
| | (0.001) | (0.001) | (0.001) |
| Land owned (ha) by household | 0.004** | 0.004*** | 0.003*** |
| | (0.001) | (0.001) | (0.001) |
| Rural (0/1) | -0.052** | -0.074*** | -0.053 |
| | (0.019) | (0.023) | (0.033) |
| Constant | 0.143** | 0.194*** | 0.174*** |
| | (0.050) | (0.026) | (0.032) |
| Observations | 16,140 | 16,140 | 16,140 |

Linear probability models are estimated. A dummy variable, which is coded as one if the household hires labor for an extended period of time, is regressed on the share of household members with a contract. Only household members over the age of 15 who contribute to household income and who participate in agricultural activities are considered. All variables refer to the household level. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S14: Labor demand at the individual level**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE | (4) Household FE |
|---|---|---|---|---|
| Contract farmer (0/1) | 0.094*** | 0.082*** | 0.080*** | 0.034*** |
| | (0.017) | (0.013) | (0.012) | (0.012) |
| Household head (0/1) | 0.024* | 0.023*** | 0.020*** | 0.029*** |
| | (0.010) | (0.007) | (0.007) | (0.006) |
| Female (0/1) | -0.004 | -0.011* | -0.013** | 0.006 |
| | (0.018) | (0.006) | (0.006) | (0.006) |
| Age (years) | 0.001** | 0.001*** | 0.001*** | 0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Any schooling (0/1) | 0.068** | 0.044*** | 0.038*** | 0.012** |
| | (0.024) | (0.007) | (0.006) | (0.006) |
| Constant | 0.062 | 0.101*** | 0.105*** | 0.118*** |
| | (0.043) | (0.011) | (0.010) | (0.010) |
| Observations | 27,761 | 27,761 | 27,761 | 27,761 |

Linear probability models are estimated. A dummy variable which is coded as one if the individual household member hires labor for an extended period of time is regressed on participation in contract farming (1/0). All variables refer to the individual. Robust standard errors clustered at the country level (1), administrative unit level (2), cluster level (3), or household level (4) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S15: Labor demand at the individual level, overview of country-level regressions**

| | (1) Admin. unit FE | (2) Cluster FE | (3) Household FE |
|---|---|---|---|
| Bangladesh (N=3,951) | -0.002 | -0.021 | -0.002 |
| | (0.034) | (0.028) | (0.031) |
| Côte d'Ivoire (N=5,354) | 0.089*** | 0.083*** | 0.046** |
| | (0.028) | (0.027) | (0.021) |
| Mozambique (N=3,979) | 0.193** | 0.174*** | -0.050 |
| | (0.066) | (0.048) | (0.033) |
| Nigeria (N=4,532) | 0.065* | 0.065* | 0.032 |
| | (0.034) | (0.034) | (0.033) |
| Tanzania (N=4,742) | 0.067*** | 0.072*** | 0.030 |
| | (0.013) | (0.014) | (0.023) |
| Uganda (N=5,203) | 0.102*** | 0.102*** | 0.037 |
| | (0.034) | (0.031) | (0.031) |

This table provides an overview of regression results by country. Linear probability models are estimated. A dummy variable, which is coded as one if the individual household member hires labor for an extended period of time, is regressed on participation in contract farming (0/1). Control variables are equivalent to those in Table S14. Standard errors clustered at the administrative unit level (1), cluster level (2), or household level (3) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S16: Prevalence of contract farming (share within cluster) and household income among the sub-sample of non-contract farmers**

| | (1) Country FE | (2) Admin. unit FE |
|---|---|---|
| Share of contract households within cluster | 0.351* | 0.082 |
| | (0.150) | (0.251) |
| Female headed household (0/1) | -0.175*** | -0.207*** |
| | (0.042) | (0.030) |
| Age of household head (yrs.) | 0.001 | -0.001 |
| | (0.002) | (0.001) |
| Household head ever attended school (0/1) | 0.221*** | 0.160*** |
| | (0.053) | (0.021) |
| No. of household members | -0.146*** | -0.139*** |
| | (0.005) | (0.005) |
| Land owned by household (ha) | 0.016** | 0.015*** |
| | (0.005) | (0.003) |
| Rural (0/1) | -0.446** | -0.474*** |
| | (0.127) | (0.070) |
| No. of households per cluster | -0.014 | -0.019* |
| | (0.016) | (0.011) |
| Constant | 0.539 | 0.742*** |
| | (0.397) | (0.155) |
| Observations | 11,174 | 11,174 |

The log of household income per capita and day is regressed on the share of contract farmers in each cluster. Standard errors clustered at the country level (1) or administrative unit level (2) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S17: Prevalence of contract farming (share within cluster) and household income among the sub-sample of non-contract farmers, overview of country-level regressions**

| | (1) Country FE | (2) Admin. unit FE |
|---|---|---|
| All countries (N=11,174) | 0.351* | 0.082 |
| | (0.150) | (0.251) |
| Bangladesh (N=2,562) | | -0.669* |
| | | (0.371) |
| Côte d'Ivoire (N=2,287) | | 0.368 |
| | | (0.356) |
| Mozambique (N=1,347) | | 0.270 |
| | | (0.898) |
| Nigeria (N=2,198) | | 0.169 |
| | | (0.807) |
| Tanzania (N=492) | | -0.241 |
| | | (0.661) |
| Uganda (N=2,288) | | 0.397 |
| | | (0.470) |

This table provides an overview of regression results by country. Control variables are equivalent to those in Table S16. The log of household income per capita and day is regressed on the share of contract farmers in each cluster. Standard errors clustered at the country level (1) or administrative unit level (2) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S18: Prevalence of contract farming (0/1) and household income among the sub-sample of non-contract farmers, overview of country-level regressions**

| | (1) Country FE | (2) Admin. unit FE |
|---|---|---|
| All countries (N= 11,174) | 0.078 | 0.004 |
| | (0.056) | (0.053) |
| Bangladesh (N=2,562) | | -0.051 |
| | | (0.050) |
| Côte d'Ivoire (N=2,287) | | 0.167* |
| | | (0.101) |
| Mozambique (N=1,347) | | -0.026 |
| | | (0.163) |
| Nigeria (N=2,198) | | 0.068 |
| | | (0.196) |
| Tanzania (N=492) | | 1.200*** |
| | | (0.402) |
| Uganda (N=2,288) | | 0.081 |
| | | (0.092) |

This table provides an overview of regression results by country. The log of household income per capita and day is regressed on a dummy variable indicating whether at the cluster includes at least on contract farmer. Control variables are equivalent to those in Table S16. Standard errors clustered at the country level (1) or administrative unit level (2) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S19: Prevalence of contract farming (share within administrative unit) and household income among the sub-sample of non-contract farmers**

| | (1) Country FE | (2) Region FE |
|---|---|---|
| All countries (N= 11,174) | 0.331* | 0.130 |
| | (0.144) | (0.176) |
| Bangladesh (N=2,562) | | 0.134 |
| | | (0.233) |
| Côte d'Ivoire (N=2,287) | | 0.794* |
| | | (0.402) |
| Mozambique (N=1,347) | | 0.324 |
| | | (1.371) |
| Nigeria (N=2,198) | | 0.305 |
| | | (0.189) |
| Tanzania (N=492) | | -0.113 |
| | | (0.228) |
| Uganda (N=2,288) | | -0.965* |
| | | (0.405) |

The log of household income per capita and day is regressed on the share of contract farmers in each administrative unit. Control variables are equivalent to those in Table S16. Standard errors clustered at the country level (1) or regional unit level (2) are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

**Table S20: Contract farming and household income among non-contract households (different subsamples in each row)**

| | (1) Country FE | (2) Admin. unit FE |
|---|---|---|
| Households with temporary or permanent wage income (N=3047) | 0.342 | 0.315 |
| | (0.231) | (0.520) |
| Households mainly relying on wage income (N=1450) | 0.025 | 0.167 |
| | (0.250) | (0.693) |
| Households with smallest 10% of landholdings (<0.008 ha) (N=1110) | -0.006 | -0.242 |
| | (0.377) | (0.442) |

This table provides an overview of regression results. The log of household income per capita and day is regressed on the share of contract farmers in each cluster. Control variables are equivalent to those in Table S16. Regressions are run for different subsamples (displayed in each row). Standard errors clustered at the country level (1) or administrative unit level (2) are shown in parentheses. $^{*}$ $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

**Table S21: Overview of regression results, alternative sets of control variables**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| Y=Household income | 0.157** | 0.131*** | 0.109*** |
| | (0.048) | (0.031) | (0.027) |
| Y=Demand for hire labor | 0.091*** | 0.085*** | 0.083*** |
| | (0.015) | (0.013) | (0.012) |
| Y=Income of non-participation households | 0.372* | 0.090 | |
| | (0.155) | (0.252) | |

Regressions are similar to those presented in Table S3 (Income), Table S11 (demand for hired labor), and Table S16 (income of non-participants), only that we exclude the variable "land size", as it could be endogenous. Standard errors clustered at the country level (1), administrative unit level (2), or cluster level (3) are shown in parentheses. $^{*}$ $p < 0.1$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$

**Table S22: IV regressions. Contract farming and household income**

| | (1) Country FE | (2) Admin. unit FE | (3) Cluster FE |
|---|---|---|---|
| Contract household (1/0) | 0.210*** | 0.076*** | 0.091** |
| | (0.077) | (0.030) | (0.036) |
| Female headed household (0/1) | -0.158*** | -0.187*** | -0.188*** |
| | (0.021) | (0.021) | (0.020) |
| Age of household head (yrs.) | 0.001*** | -0.000 | -0.000 |
| | (0.001) | (0.001) | (0.001) |
| Household head ever attended school (0/1) | 0.237*** | 0.170*** | 0.147*** |
| | (0.017) | (0.017) | (0.018) |
| No. of household members | -0.150*** | -0.142*** | -0.140*** |
| | (0.003) | (0.003) | (0.003) |
| Land owned by household (ha) | 0.011*** | 0.012*** | 0.012*** |
| | (0.001) | (0.001) | (0.001) |
| Rural (1/0) | -0.489*** | -0.470*** | -0.436 |
| | (0.022) | (0.030) | (0.287) |
| Constant | 0.274*** | 0.373*** | 0.345 |
| | (0.040) | (0.041) | (0.245) |
| F-statistic (Weak instrument test) | 623.58 | 11.64 | 7.74 |
| Observations | 14573 | 14573 | 14573 |

Outcome variable: log of income per capita and day. IV: share of households participating in contract farming in each administrative unit (excludes the household under consideration if the respective household is a contract household). Standard errors are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.