Appendix A1: Endogenous plot selection

This appendix describes the process through which a farmer (household) chooses the number and locations of its plots.

Consider first the household's option of producing on a single plot, $[0, L_h]$, making use of the entire land endowment. The profit maximization problem is then given by:

$$\max_{X_h}\left[\left(\frac{X_h}{L_h}\right)^{\theta}\int_0^{L_h}\gamma_h(k,s)\zeta_h(k)\,dk - w_h X_h - c\right]. \qquad \text{(A1.1)}$$

As an alternative to the single plot, the household could instead farm multiple plots. We assume that the household divides its landholding into plots at the start of the season, before inputs are chosen and – crucially – before the realization of the productivity shock. In modelling the farm in this way, we seek to capture the notion that inputs can be adjusted through most of the growing season, so that the total input vector responds to the shocks. But plot boundaries cannot normally be adjusted once planting has taken place – and indeed, plot boundaries are often set even before planting, with a series of decisions that commit the household to planting certain crops at certain moments. For instance, the timing and techniques of land preparation will be linked to decisions about plot boundaries and potentially also crop choice.

Consider first the problem of a household that is choosing a single boundary that will define two plots. Denote the threshold location between the two plots as L_{h1}, so that the two plots are $[0, L_{h1}]$ and $[L_{h1}, L_h]$. In this case, an interior solution for the size of the two plots must hold; expected total profits could not be increased by moving this location either to the left or the right on the number line.

The profit maximization problem can be written as:

$$\max_{\mathrm{L}_{h1}} \int_{s\in S} \left[\max_{X_{h1},X_{h2}} \left[\left(\frac{X_{h1}}{L_{h1}}\right)^{\theta} \int_{0}^{\mathrm{L}_{h1}} \gamma_h(k,s)\zeta_h(k)\,dk + \left(\frac{X_{h1}}{L_h - L_{h1}}\right)^{\theta} \int_{\mathrm{L}_{h1}}^{\mathrm{L}_h} \gamma_h(k,s)\zeta_h(k)\,dk - w_h X_{h1} - w_h X_{h2} - 2c \right]\right] d\Delta(s). \tag{A1.2}$$

In effect, the household chooses the plot boundary L_{h1} to maximize expected profits, knowing what input bundle it would choose for each plot for every realization of the productivity shock $\gamma_h(k,s)$. The problem is well-defined.

Now consider a household that farms I plots, $I > 2$. We use the notation that L_{hi} will denote the right-hand boundary of the ith plot; i.e., the boundary between plot i and plot $i+1$. For notational convenience, we set $\mathrm{L}_{h0} = 0$ and $\mathrm{L}_{hI} = \mathrm{L}_h$. Then $\{\mathrm{L}_{hi}\}_{i=0}^{I}$ is the sequence of plot boundaries. The first plot is given by the interval $[0, \mathrm{L}_{h1}]$, and the ith plot covers the interval $[\mathrm{L}_{hi-1}, \mathrm{L}_{hi}]$, continuing to the Ith plot, which covers $[\mathrm{L}_{hI-1}, \mathrm{L}_h]$.

We assume for convenience in what follows that all the plots are of sufficient quality that they will be actively farmed, allowing for an interior solution. The logic of the analysis would extend, however, to a situation in which the household chooses not to cultivate some portion of its land.

For notational convenience, let the size of the ith plot be denoted as $\tilde{L}_{hi} \equiv (L_{hi-1} - L_{hi})$. As before, the average productivity of plot i, conditional on the realization of the shock $\gamma_h(k,s)$, can be written as $\zeta_{hi} = \frac{1}{\tilde{L}_{hi}} \int_{L_{hi-1}}^{L_{hi}} \gamma_i(k,s)\zeta_i(k)\, dk$.

Then the household's problem of choosing the boundaries of I plots can be written as:

$$E\hat{\pi}(I) = \max_{\{L_{hi}\}_{i=1}^{I}} \int_{s \in S} s \left[\max_{\{X_{hi}\}_{i=1}^{I}} \left[\zeta_{hi} \tilde{L}_{ij} X_{hi}^{\theta} - \sum_{i=1}^{I} w_h X_{hi} \tilde{L}_{hi} - cI \right] \right] d\Delta(s). \quad \text{(A1.3)}$$

How many plots might the household farm? We can identify a finite maximum number of plots for any household. Because the problem in equation (7) is well-defined for any number of plots I, we use this to define an upper bound for I. Recall that for a single location k, the household can maximize profits conditional on the shock s, by choosing a point-specific input bundle. This gives output $q_h^*(k,s) = \zeta_h(k)\gamma_h(k,s)\left(\frac{\theta\gamma_h(k,s)\zeta_h(k)}{w_h}\right)^{\frac{\theta}{1-\theta}}$ with corresponding profits of $\pi_h^*(k,s) = q_h^*(k,s) - w_h \xi_h^*(k,s)$. Across the entire land holding of the household, this gives rise to an expression for the maximum profits that can be earned, conditional on the shock s, with $c = 0$: $\pi_h^*(s) = \int_0^{L_h} \pi_h^*(k,s)\, dk$. This expression can be understood as the "precision agriculture profits" in which every location on the household's land holdings is farmed with optimal point-specific inputs. Integrating over possible realizations of the shock s, then $\pi_h^* = \int_{s\in S} \pi_h^*(k,s)\, d\Delta(s)$ is the expected maximum profits. Given this, $I^* = \left(\frac{\pi_h^*}{c} + 1\right)$ is an upper bound for the number of plots that can be profitably cultivated.

With this upper bound defined, the household's choice of its optimal number of plots reduces to a discrete optimization, with $\hat{I} = \text{argmax}_j \{E\hat{\pi}(j)\}_{j=1}^{I^*}$.

We now consider the relationship between plot quality and plot size within a farm. A simple illustration is provided by the special case of a farmer who has access to multiple physical parcels, each of unit size. Parcel i has average productivity $\zeta_{hi} = \int_0^1 \gamma_i(k,s)\zeta_i(k)\,dk$. If that parcel can be partitioned into two plots (A and B) of any size such that $\zeta_{hi}^A \neq \zeta_{hi}^B$, then there exists a scalar $z^* \geq 0$ such that $\forall z \geq z^*$, if we replace $\zeta_i(k)$ with $\zeta_{zi}(k) = z\zeta_i(k)$, it is optimal to split the parcel into more than one plot. Therefore, if a parcel is divided into multiple plots, then a more productive parcel is also divided. And a sufficiently less productive parcel will not be.

Define $\pi_{1i} = \zeta_{hi}\left(\frac{\zeta_{hi}\theta}{w_h}\right)^{\frac{\theta}{1-\theta}} - w_h\left(\frac{\zeta_{hi}\theta}{w_h}\right)^{\frac{1}{1-\theta}}$ as the profit from farming the parcel as a unit. Let L_{hi}^A and $L_{hi}^B = 1 - L_{hi}^A$ be the areas of the two plots that optimally divide parcel i (the solution to (A1.2)). So $\pi_{1i}^A = L_{hi}^A\zeta_{hi}^A\left(\frac{\zeta_{hi}^A\theta}{w_h}\right)^{\frac{\theta}{1-\theta}} - w_h L_{hi}^A\left(\frac{\zeta_{hi}^A\theta}{w_h}\right)^{\frac{1}{1-\theta}}$ and $\pi_{1i}^B = L_{hi}^B\zeta_{hi}^B\left(\frac{\zeta_{hi}^B\theta}{w_h}\right)^{\frac{\theta}{1-\theta}} - w_h L_{hi}^B\left(\frac{\zeta_{hi}^B\theta}{w_h}\right)^{\frac{1}{1-\theta}}$. Define $\zeta_{zi} = \int_0^1 \gamma_i(k,s)\zeta_{zi}(k)\,dk = z\zeta_{hi}$ as the average productivity of the z-transformed parcel, and π_{zi}, π_{zi}^A, and π_{zi}^B as the profits from farming the full parcel, and optimally subdivided if the productivity process is $\zeta_{zi}(k)$. Finally, define $\tilde{\pi}_{zi}^A = L_{hi}^A\zeta_{zi}^A\left(\frac{\zeta_{zi}^A\theta}{w_h}\right)^{\frac{\theta}{1-\theta}} - w_h L_{hi}^A\left(\frac{\zeta_{zi}^A\theta}{w_h}\right)^{\frac{1}{1-\theta}}$, and similarly $\tilde{\pi}_{zi}^B$ as the maximized profits generated on plots A and B of the z-transformed parcel, where plots A and B are defined by the optimal partition of the parcel given its original productivity.

$\zeta_{hi}^A \neq \zeta_{hi}^B$ implies that $\frac{X_{1i}^A}{L_{1i}^A} \neq \frac{X_{1i}^B}{L_{1i}^B}$ so for $\theta < 1$,

$$\pi_{1i} = L_{hi}^A\pi_{1i} + L_{hi}^B\pi_{1i} < \pi_{1i}^A + \pi_{1i}^B.$$

Suppose $\pi_{1i}^A + \pi_{1i}^B - c > \pi_{1i}$. Then for all $z \geq 1$,

$$\pi_{zi}^A + \pi_{zi}^B - c \geq \tilde{\pi}_{zi}^A + \tilde{\pi}_{zi}^B - c = z^{\frac{1}{1-\theta}}\left(\pi_{1i}^A + \pi_{1i}^B\right) - c > z^{\frac{1}{1-\theta}}\pi_{1i} = \pi_{zi}. \tag{A1.4}$$

Therefore, if a parcel is divided into more than one plot, then any more productive parcel is also divided. Conversely, for a sufficiently low value of z, $\pi_{zi}^A + \pi_{zi}^B < c$ and it is not feasible to divide the parcel.

Appendix A2: Estimating the within-farm variances of measurement error, late-season risk, and unobserved productivity

We consider a plot i farmed by household (farmer) h in season t. We define log TFP for the plot, inclusive of the plot-specific factor productivities, as

$$z_{hit} \equiv \frac{1}{1-\sum_J \alpha_{Jhit}}\left\{W_{Ehit}\beta_E + \omega_{Yhit} + \alpha_{Lhit}\ln\left(\frac{\alpha_{Lhit}}{p_{Lht}}\right) + \alpha_{Xhit}\ln\left(\frac{\alpha_{Xhit}}{p_{Xht}}\right)\right\} \tag{A2.1}$$

We write log output and (actual, not observed) factor demand on the plot as

$$\begin{aligned} y_{hit} &= W_{Hhit}\beta_H + \epsilon_{Yhit} + z_{hit} \\ l_{hit} &= \ln(\alpha_{Lhit}) - \ln(p_{lht}) + z_{hit} \\ x_{hit} &= \ln(\alpha_{Xhit}) - \ln(p_{Xht}) + z_{hit} \end{aligned} \tag{A2.2}$$

The IVCRC procedure provides us with an estimate of the means of the distribution of the factor productivity coefficients, $\hat{\alpha}_L$ and $\hat{\alpha}_X$. We define the plot-specific factor productivities $\omega_{Lhit} = \ln(\alpha_{Lhit}) - \hat{\alpha}_L$ and $\omega_{Xhit} = \ln(\alpha_{Xhit}) - \hat{\alpha}_X$. We will work in terms of observable inputs, and output, adjusted for the estimated effects of observed characteristics

$$\begin{aligned} y_{hit} - W_{Hhit}\hat{\beta}_H &= \epsilon_{Yhit} + q_{hit} \\ l^o_{hit} + W_{Lhit}\hat{\beta}_L &= \hat{\alpha}_L + \omega_{Lhit} - \ln(p_{Lht}) + \epsilon_{Lhit} + q_{hit} \\ x^o_{hit} + W_{Xhit}\hat{\beta}_X &= \hat{\alpha}_X + \omega_{Xhit} - \ln(p_{Xht}) + \epsilon_{Xhit} + q_{hit} \end{aligned} \tag{A2.3}$$

ω_{Lhit} and ω_{Xhit} are plot level productivities of land and labor and and z_{hit} is plot level total productivity.

$$\begin{aligned} \tilde{y}_{hit} &\equiv y_{hit} - \bar{y}_{h.t} - (W_{Hhit} - \overline{W}_{Hh.t})\hat{\beta}_H \\ &= \epsilon_{Yhit} - \bar{\epsilon}_{Yh.t} + z_{hit} - \bar{z}_{h.t} \end{aligned} \tag{A2.4}$$

$$\tilde{l}_{hit} \equiv l^{o}_{hit} - \bar{l}^{o}_{h.t} + (W_{Lhit} - \bar{W}_{Lh.t})\hat{\beta}_L$$
$$= \omega_{Lhit} - \bar{\omega}_{Lh.t} + \epsilon_{Lhit} - \bar{\epsilon}_{Lh.t} + q_{hit} - \bar{q}_{h.t}$$
$$\tilde{x}_{hit} \equiv x^{o}_{hit} - \bar{x}^{o}_{h.t} + (W_{Xhit} - \bar{W}_{Xh.t})\hat{\beta}_X$$
$$= \omega_{Xhit} - \bar{\omega}_{Xh.t} + \epsilon_{Xhit} - \bar{\epsilon}_{Xh.t} + q_{hit} - \bar{q}_{h.t}$$

The LHS of these are observable. Their covariance (and a normalization discussed below) provides us with sufficient information to identify the within-farm variances of plot-level total factor productivity (σ^2_q), factor-specific productivity and their covariance ($\sigma^2_L, \sigma^2_X, \sigma_{LX}$), factor measurement error ($\sigma^2_{\epsilon L}, \sigma^2_{\epsilon X}$) and output measurement error and post-input risk $\left(\sigma^2_{\epsilon y}\right)$, as well as the covariance of plot-level total factor productivity and factor-specific productivity $\left(\sigma_{QL}, \sigma_{QX}\right)$:

$$\begin{aligned} var(\tilde{y}_{hit}) &= \sigma^2_Q + \sigma^2_{\epsilon Yhit} \\ var(\tilde{l}_{hit}) &= \sigma^2_L + \sigma^2_{\epsilon L} + \sigma^2_Q + 2\sigma_{QL} \\ var(\tilde{x}_{hit}) &= \sigma^2_X + \sigma^2_{\epsilon X} + \sigma^2_Q + 2\sigma_{QX} \\ cov(\tilde{y}_{hit}, \tilde{l}_{hit}) &= \sigma_{QL} + \sigma^2_Q \\ cov(\tilde{y}_{hit}, \tilde{x}_{hit}) &= \sigma_{QX} + \sigma^2_Q \\ cov(\tilde{l}_{hit}, \tilde{x}_{hit}) &= \sigma_{LX} + \sigma_{QL} + \sigma_{QX} + \sigma^2_Q \end{aligned} \qquad \text{(A2.5)}$$

We will not separately identify variation in all three types of unobserved heterogeneity in factor ($\omega_{Lhit}, \omega_{Xhit}$) or total-factor productivity (z_{hit}): a parallel increase in ω_{Lhit} and ω_{Xhit} is equivalent to an increase in z_{hit}. Hence, we normalize $\omega_{Lhit} + \omega_{Xhit} = 0$. Intuitively, a change in ω_{Lhit} relative to ω_{Xhit} is a change in the slope of an isoquant; a change in z_{hit} is a shift in or out of an isoquant. The normalization of factor specific productivities distinguishes these from TFP shocks; this normalization adds the restrictions

$$\begin{aligned} \sigma^2_L &= \sigma^2_X \\ \sigma_{LX} &= -\sigma^2_L \\ \sigma_{QL} &= -\sigma_{QX} \end{aligned} \qquad \text{(A2.6)}$$

From equations (A2.5)-(A2.6) we calculate the parameters ($\hat{\sigma}^2_q, \hat{\sigma}^2_L, \hat{\sigma}^2_X, \hat{\sigma}^2_{\epsilon y}, \hat{\sigma}^2_{\epsilon L}, \hat{\sigma}^2_{\epsilon X}, \hat{\sigma}_{LX}, \hat{\sigma}_{QL}, \hat{\sigma}_{QX}$) that are consistent with the observed covariance of plot level output and inputs across plots within farms, given an estimate of the production function parameters and the assumption of efficient allocation across plots within a farm.

Appendix A3: Measurement error / shock variances across all plots and average across farmers of within-farmer variances

We estimate the mean, across farmers, of the within-farm, cross-plot variance of measurement errors in factor inputs and of measurement error and late-season shocks to output. How does this compare the overall variance, across all plots, of these measurement errors/random shocks?

Denote by y_{fi} the realization of any of these errors/shocks $(\epsilon_{Yhit}, \epsilon_{Lhit}, \epsilon_{Xhit})$.[31] Let N be the total number of plots, N^f the number of farmers and N_f^i be the number of plots of farmer f. The average across farmers of the cross-plot within-farmer variance of y is $\sigma_F^2 \equiv \frac{1}{N^f}\sum_{f=1}^{N^f}\frac{1}{N_f^i}\sum_{i=1}^{N_f^i}(y_{fi}-\bar{y}_f)^2$. The variance of y across plots in the sample is $\sigma^2 \equiv \frac{1}{N}\sum_{f=1}^{N^f}\sum_{i=1}^{N_f^i}(y_{fi}-\bar{y})^2$. If there are no farmer effects in measurement error or the late season shock to output, then $\bar{y}_f = \bar{y}\ \forall f$ and $\sigma_F^2 = \sigma^2$.

However, if there is variation across farmers in the mean level of measurement error or the late season shock, then the average across farmers of the within-farmer variance may differ from the variance across all plots. The largest number of plots cultivated by a single farmer is $\bar{k}$. We partition the sample of farmers into sets $\{M_1, M_2, \ldots, M_{\bar{k}}\}$ such that each farmer $f \in M_k$ has k plots. With some abuse of notation we denote the cardinality of each set M_k as M_k. Then we have

$$\sigma_{Fk}^2 = \frac{1}{M_k}\sum_{f\in M_k}\frac{1}{k}\sum_{i=1}^{k}(y_{fi}-\bar{y}_f)^2$$

[31] We drop the t subscript for this appendix; the calculations should be understood as occurring within any season.

$$\sigma_k^2 = \frac{1}{kM_k} \sum_{f \in M_k} \sum_{i=1}^{k} (y_{fi} - \bar{y}_k)^2$$

With these sets defined, the overall variance of y can be defined as

$$\begin{aligned} \sigma^2 &= \frac{1}{N} \sum_{k=1}^{\bar{k}} \sum_{f \in M_k} \sum_{i=1}^{k} y_{fi}^2 - \left(\frac{1}{N} \sum_{k=1}^{\bar{k}} k M_k \overline{y_k} \right)^2 \\ &\geq \frac{1}{N} \sum_{k=1}^{\bar{k}} \sum_{f \in M_k} \sum_{i=1}^{k} y_{fi}^2 - \frac{1}{N} \sum_{k=1}^{\bar{k}} M_k k (\overline{y_k})^2 \\ &= \frac{1}{N} \sum_{k=1}^{\bar{k}} [M_k k \sigma_k^2]. \end{aligned} \tag{A3.1}$$

where the inequality follows from convexity (and is a strict equality if $\bar{y}_f = \bar{y} \; \forall f$. The average across farmers of the variance of y is

$$\sigma_F^2 = \frac{1}{N_F} \sum_{k=1}^{\bar{k}} M_k \sigma_{Fk}^2.$$

So

$$\sigma^2 - \sigma_F^2 \geq \sum_{k=1}^{\bar{k}} \left(\frac{k}{N} - \frac{1}{N_F} \right) M_k \sigma_{Fk}^2. \tag{A3.2}$$

If each farmer has the same number of plots, then the weak inequality in (2) is an equality, and $\sum_{k=1}^{\bar{k}} \left(\frac{k}{N} - \frac{1}{N_F} \right) M_k \sigma_{Fk}^2 = 0$ and the average across farmers of the within-farmer variance of plot yield is the same as the overall variance of plot yields.

Note that $\left(\frac{k}{N} - \frac{1}{N_F} \right)$ is increasing in k. If the average number of plots per farmer is less than or equal to 2, then $\left(\frac{k}{N} - \frac{1}{N_F} \right) \geq 0$ for all k and $\sigma^2 - \sigma_F^2 \geq 0$. The average number of plots per farmer in Tanzania is 1.95. Therefore, the average across farmers of the within-farmer variance of y is less than the overall variance of y in Tanzania.

In Uganda the average number of plots per farmer is 2.7. If the average variance of y across plots of farmers who have only 2 plots is much larger than the average variance of y across plots of farmers who have many more plots, than it is possible that the RHS of (A2) is negative. Given the observed number of plots (N), number of farmers (N_F) and numbers of farmers cultivating k plots (M_k), then we can calculate that if $\sigma_{F2}^2 \leq 3.82 * \sigma_{Fk}^2$ for $k > 2$, then $\sum_{k=1}^{\bar{k}} \left(\frac{k}{N} - \frac{1}{N_F}\right) M_k \sigma_{Fk}^2 > 0$. That is, as long as the average variance across plots of y of farmers cultivating 2 plots is no more than about 4 times as large as the average variance across plots of y of farmers cultivating more than 2 plots, then the overall variance of y across plots is larger than the average across farmers of within-farmer cross-plot variance of y.

Appendix Table A4a: OLS and Quantile Regression Determinants of Land and Labor Inputs in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Male Plot	0.36	0.21	0.31	0.25	0.32	0.19	0.37	0.21	0.059	-0.037
	(.022)	(.019)	(.027)	(.03)	(.024)	(.023)	(.026)	(.02)	(.03)	(.021)
EVI*Good Soil in HH	-0.1	-0.025	-0.06	-0.029	-0.11	-0.021	-0.13	-0.027	-0.068	0.0025
	(.03)	(.027)	(.039)	(.043)	(.034)	(.031)	(.035)	(.029)	(.039)	(.039)
EVI*Avg Soil in HH	-0.056	0.027	0.011	0.049	-0.073	0.042	-0.11	0.012	-0.12	-0.037
	(.029)	(.026)	(.036)	(.042)	(.031)	(.03)	(.037)	(.027)	(.05)	(.054)
EVI*Poor Soil in HH	-0.048	0.018	-0.0033	0.021	-0.054	0.056	-0.049	0.05	-0.046	0.029
	(.048)	(.043)	(.037)	(.074)	(.064)	(.056)	(.04)	(.042)	(.071)	(.063)
EVI*Loam in HH	-0.057	-0.11	-0.096	-0.11	-0.056	-0.12	-0.087	-0.11	0.0085	0.002
	(.028)	(.025)	(.034)	(.04)	(.031)	(.029)	(.033)	(.027)	(.037)	(.039)
EVI*Clay in HH	-0.048	-0.061	-0.099	-0.049	-0.05	-0.046	-0.067	-0.081	0.032	-0.031
	(.036)	(.033)	(.044)	(.052)	(.041)	(.036)	(.042)	(.033)	(.059)	(.042)
EVI*Other in HH	-0.13	-0.16	-0.15	-0.1	-0.16	-0.15	-0.093	-0.15	0.055	-0.049
	(.062)	(.056)	(.081)	(.077)	(.053)	(.035)	(.068)	(.083)	(.099)	(.11)
Livestock death or stolen	0.098	0.014	0.082	-0.00037	0.087	0.017	0.12	0.048	0.037	0.049
	(.022)	(.02)	(.03)	(.026)	(.027)	(.024)	(.029)	(.023)	(.04)	(.029)
illness/accident of hh member	0.07	-0.023	0.049	-0.044	0.11	-0.035	0.081	0.0024	0.031	0.046
	(.035)	(.031)	(.059)	(.046)	(.04)	(.042)	(.046)	(.025)	(.057)	(.049)
death of hh member	0.15	0.071	0.12	0.085	0.14	0.099	0.13	0.073	0.012	-0.012
	(.028)	(.025)	(.033)	(.031)	(.03)	(.03)	(.035)	(.025)	(.044)	(.046)

Appendix Table A4a: OLS and Quantile Regression Determinants of Land and Labor Inputs in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Property Crime	0.036	-0.073	0.063	-0.13	0.017	-0.077	0.052	-0.047	-0.012	0.079
	(.035)	(.032)	(.039)	(.039)	(.041)	(.037)	(.051)	(.035)	(.06)	(.062)
Zcrops_lost	-0.075	-0.021	-0.078	-0.024	-0.065	-0.02	-0.069	-0.022	0.0086	0.0026
	(.012)	(.011)	(.012)	(.015)	(.013)	(.012)	(.014)	(.011)	(.021)	(.02)
log Plot Value	2.30E-01	9.80E-02	2.10E-01	1.20E-01	2.40E-01	1.10E-01	2.70E-01	9.50E-02	5.80E-02	-2.40E-02
	(.0078)	(.007)	(.01)	(.0097)	(.0083)	(.0082)	(.0094)	(.0073)	(.0097)	(.012)
lnsale_valuem	-0.055	-0.004	-0.016	-0.042	-0.02	-0.028	-0.11	-0.02	-0.094	0.022
	(.067)	(.06)	(.068)	(.073)	(.1)	(.051)	(.057)	(.034)	(.095)	(.098)
(first) dist_home	0.0022	0.000051	0.0024	0.00073	0.0024	-0.00025	0.0027	-0.0009	0.00034	-0.0016
	(.0004)	(.00036)	(.00024)	(.0002)	(.00076)	(.00014)	(.00042)	(.00016)	(.00057)	(.0003)
(first) dist_road	0.024	0.018	0.028	0.02	0.028	0.022	0.028	0.019	0.000002	-0.00049
	(.0018)	(.0016)	(.0029)	(.0016)	(.0017)	(.0014)	(.0022)	(.00093)	(.0042)	(.0028)
soil_quality==1	-0.17	-0.42	-0.13	-0.58	-0.2	-0.22	-0.2	-0.51	-0.073	0.069
	(.28)	(.25)	(.24)	(.34)	(.37)	(.3)	(.33)	(.31)	(.5)	(.44)
soil_quality==2	0.43	-0.096	0.9	-0.088	0.53	0.13	0.22	-0.33	-0.68	-0.24
	(.28)	(.25)	(.24)	(.34)	(.37)	(.3)	(.34)	(.31)	(.47)	(.52)
soil_type==1	-2.22	-1.36	-1.79	-1.34	-2.41	-2.38	-2.05	-0.91	-0.26	0.43
	(.59)	(.53)	(.57)	(.74)	(.37)	(.37)	(.6)	(.45)	(1.41)	(.73)
soil_type==2	-1.98	-1.2	-1.89	-1.41	-2.21	-1.93	-1.73	-0.62	0.15	0.8
	(.58)	(.52)	(.55)	(.73)	(.34)	(.34)	(.58)	(.43)	(1.42)	(.7)

Appendix Table A4a: OLS and Quantile Regression Determinants of Land and Labor Inputs in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
soil_type==3	-1.59	-1.23	-1.59	-1.5	-1.8	-1.99	-1.31	-0.63	0.28	0.88
	(.6)	(.53)	(.58)	(.74)	(.38)	(.37)	(.59)	(.44)	(1.46)	(.64)
(first) single_manager	-0.045	-0.12	-0.059	-0.13	-0.045	-0.11	-0.051	-0.12	0.0084	0.016
	(.021)	(.019)	(.027)	(.025)	(.023)	(.021)	(.025)	(.02)	(.041)	(.028)
health	-0.015	-0.0074	-0.027	-0.00099	-0.018	0.0028	-0.015	-0.0063	0.012	-0.0053
	(.0056)	(.005)	(.007)	(.0077)	(.0067)	(.0063)	(.0072)	(.005)	(.0081)	(.009)
healthm	-0.1	0.059	-0.17	0.11	-0.11	0.09	-0.095	0.015	0.072	-0.099
	(.033)	(.03)	(.047)	(.032)	(.037)	(.038)	(.043)	(.031)	(.048)	(.04)
literacy==1	0.027	0.071	0.024	0.12	0.013	0.053	-0.017	0.044	-0.041	-0.077
	(.026)	(.024)	(.037)	(.032)	(.032)	(.029)	(.035)	(.024)	(.052)	(.038)
literacy==9	-0.15	-0.012	-0.036	0.042	-0.29	-0.16	-0.25	-0.13	-0.22	-0.18
	(.21)	(.19)	(.14)	(.077)	(.24)	(.08)	(.36)	(.13)	(.37)	(.19)
Average age of plot managers	0.0061	0.0064	0.0043	0.0062	0.0051	0.0064	0.0071	0.0074	0.0029	0.0012
	(.00062)	(.00056)	(.00083)	(.00079)	(.00072)	(.00067)	(.0008)	(.00057)	(.00085)	(.0011)
av_agem	-5.95	-6.31	-4.36	-5.87	-4.89	-6.18	-6.96	-7.27	-2.6	-1.4
	(.62)	(.55)	(.8)	(.76)	(.7)	(.64)	(.76)	(.55)	(.95)	(1.05)
Crops Lost	0.12	0.091	0.12	0.11	0.1	0.1	0.11	0.088	-0.0065	-0.022
	(.019)	(.017)	(.02)	(.024)	(.022)	(.02)	(.023)	(.018)	(.036)	(.028)
Adverse plot shock	0.26	0.14	0.29	0.2	0.25	0.15	0.21	0.07	-0.08	-0.13
	(.022)	(.02)	(.027)	(.026)	(.025)	(.022)	(.027)	(.019)	(.038)	(.031)
(soil_quality==1)*evimax	0.14	1.48	0.16	1.66	0.51	2.2	0.23	1.47	0.064	-0.18

Appendix Table A4a: OLS and Quantile Regression Determinants of Land and Labor Inputs in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
	(.31)	(.28)	(.37)	(.32)	(.37)	(.34)	(.38)	(.32)	(.57)	(.38)
(soil_quality==2)*evimax	-1.28	0.77	-2.17	0.62	-1.14	1.47	-0.78	1.04	1.39	0.42
	(.3)	(.27)	(.37)	(.36)	(.36)	(.31)	(.38)	(.32)	(.51)	(.49)
(soil_quality==3)*evimax	-0.4	0.5	-0.37	0.27	-0.064	1.6	-0.37	0.28	-0.0051	0.011
	(.56)	(.5)	(.43)	(.71)	(.74)	(.59)	(.63)	(.61)	(.91)	(.77)
(soil_type==2)*evimax	-0.48	-0.14	0.25	0.34	-0.44	-0.69	-0.64	-0.43	-0.89	-0.78
	(.32)	(.28)	(.37)	(.35)	(.38)	(.33)	(.4)	(.32)	(.62)	(.38)
(soil_type==3)*evimax	-1.28	0.026	-0.3	0.64	-1.31	-0.47	-1.59	-0.33	-1.29	-0.97
	(.4)	(.36)	(.51)	(.46)	(.48)	(.42)	(.47)	(.37)	(.71)	(.59)
(soil_type==4)*evimax	-4.38	-2.45	-3.42	-2.5	-4.88	-4.54	-4.31	-1.68	-0.9	0.82
	(1.16)	(1.04)	(1.16)	(1.41)	(.86)	(.75)	(1.13)	(.96)	(2.65)	(1.43)
Drought/Floods	0.044	0.12	0.047	0.14	0.015	0.15	0.014	0.085	-0.033	-0.053
	(.02)	(.018)	(.025)	(.024)	(.023)	(.021)	(.027)	(.019)	(.038)	(.022)
Crop disease or pest	-0.0036	0.063	-0.015	0.032	0.0048	0.039	-0.022	0.071	-0.0069	0.039
	(.021)	(.019)	(.028)	(.027)	(.024)	(.023)	(.026)	(.019)	(.038)	(.026)
severe water shortage	0.14	0.011	0.17	0.021	0.15	0.0067	0.13	0.026	-0.042	0.0056
	(.021)	(.019)	(.028)	(.026)	(.023)	(.02)	(.025)	(.021)	(.033)	(.033)
Adverse plot shock in HH	-0.02	-0.023	-0.024	-0.029	-0.017	-0.015	-0.011	-0.027	0.013	0.0019
	(.014)	(.012)	(.017)	(.016)	(.012)	(.013)	(.018)	(.01)	(.022)	(.018)
Constant	-4E-08	-8E-08	-0.62	-0.54	-0.0037	0.063	0.63	0.63	1.25	1.16
	-0.0085	-0.0076	-0.012	-0.012	-0.01	-0.0096	-0.012	-0.0089	-0.017	-0.0089

Appendix Table A4a: OLS and Quantile Regression Determinants of Land and Labor Inputs in Tanzania

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
F statistic; see note #.	26.8	12.2	15.6	7.85	25.8	10.8	26.8	15.2		
Corresponding p value	8.8E-61	5.2E-25	2.1E-33	8.5E-15	2.3E-58	8.1E-22	9.5E-61	2.9E-32		
F statistic; see note §.									23.2	11.1
Corresponding p value									3E-80	5.6E-34

Standard errors in parentheses
#F statistic for joint significance of variables used as production function instruments in Table 5b.
§F stat for h0 – coefficients of instruments equal for 25th and 75th percentile.

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Male Plot	0.14	0.1	0.13	0.092	0.14	0.11	0.14	0.11	0.014	0.021
	(.01)	(.008)	(.012)	(.01)	(.011)	(.0082)	(.011)	(.0083)	(.013)	(.013)
EVI*Avg Soil in HH	-0.00018	-0.00037	-0.00031	-0.00038	-0.00013	-0.00039	-0.00053	-0.00046	-0.00022	-0.000074
	(.00018)	(.00016)	(.00023)	(.00019)	(.00019)	(.00014)	(.00022)	(.00015)	(.00027)	(.00022)
EVI*Poor Soil in HH	0.00041	0.00039	0.00062	-0.00045	0.00049	-0.00052	-0.000092	0.0003	-0.00071	0.00075
	(.00059)	(.00052)	(.00068)	(.00048)	(.00075)	(.00046)	(.00072)	(.00047)	(.00068)	(.00067)
EVI*Missing Soil in HH	-0.0066	-0.00038	-0.0051	-0.00048	-0.0043	0.00092	-0.0049	-0.0017	0.00024	-0.0012
	(.0019)	(.0015)	(.0024)	(.0016)	(.0016)	(.0012)	(.0017)	(.0012)	(.0039)	(.0016)
Drought*Avg Soil in HH	-0.0063	-0.0071	-0.01	-0.0075	-0.0057	-0.0068	-0.0051	-0.0075	0.0052	-0.000077
	(.002)	(.0016)	(.0025)	(.0018)	(.0016)	(.0015)	(.0018)	(.0014)	(.0023)	(.0025)
Drought*Poor Soil in HH	-0.0029	0.00075	-0.0045	0.000049	-0.0063	0.0032	-0.0021	0.0053	0.0024	0.0053
	(.0044)	(.0037)	(.005)	(.0025)	(.0047)	(.0037)	(.0049)	(.0035)	(.0058)	(.0057)
Drought*Missing Soil in HH	-0.031	0.023	-0.041	0.018	-0.024	0.017	-0.0017	0.029	0.039	0.011
	(.0089)	(.0059)	(.013)	(.007)	(.0084)	(.0072)	(.0075)	(.0044)	(.015)	(.0086)
Illness Incidence in household	-0.0072	-0.073	-0.0059	-0.084	0.0014	-0.088	-0.013	-0.096	-0.0071	-0.011
	(.014)	(.011)	(.016)	(.015)	(.013)	(.012)	(.015)	(.012)	(.022)	(.02)
Household non-agric shock	0.088	-0.0023	0.08	-0.0011	0.072	-0.0041	0.09	-0.0097	0.01	-0.0086
	(.029)	(.023)	(.023)	(.031)	(.033)	(.022)	(.026)	(.021)	(.034)	(.033)
No of household members	0.026	0.017	0.024	0.02	0.023	0.016	0.026	0.017	0.0015	-0.003
	(.0024)	(.0019)	(.003)	(.0027)	(.0024)	(.0019)	(.0026)	(.002)	(.003)	(.0029)

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
No of adults in household	0.011	0.0082	0.011	0.0041	0.016	0.0075	0.0093	0.0078	-0.0019	0.0037
	(.0033)	(.0027)	(.0042)	(.0037)	(.0034)	(.0027)	(.0037)	(.0029)	(.005)	(.0039)
Housing Quality	0.079	0.025	0.059	0.016	0.063	0.0058	0.063	0.025	0.0042	0.0088
	(.012)	(.01)	(.015)	(.013)	(.013)	(.0099)	(.013)	(.01)	(.021)	(.013)
	-0.015	-0.076	-0.022	-0.093	-0.0034	-0.052	0.019	-0.03	0.041	0.062
Every household member has at least o										
	(.011)	(.0087)	(.014)	(.011)	(.012)	(.0088)	(.012)	(.0091)	(.02)	(.012)
Household electricity access dummy	0.087	0.052	0.13	0.035	0.093	0.03	0.015	0.026	-0.11	-0.0093
	(.022)	(.017)	(.021)	(.018)	(.025)	(.017)	(.019)	(.016)	(.035)	(.024)
Literacy of plot managers	0.037	0.016	0.035	0.026	0.046	0.024	0.025	0.017	-0.01	-0.0095
	(.014)	(.012)	(.018)	(.02)	(.015)	(.013)	(.02)	(.014)	(.016)	(.023)
Schooling level of plot managers	0.00018	0.0079	-0.016	0.017	-0.0042	0.0063	-0.0058	-0.01	0.01	-0.028
	(.014)	(.012)	(.018)	(.017)	(.015)	(.014)	(.016)	(.013)	(.019)	(.016)
Plot manager is recent resident	0.061	0.099	0.061	0.097	0.09	0.091	0.086	0.1	0.025	0.006
	(.022)	(.018)	(.04)	(.021)	(.021)	(.018)	(.026)	(.019)	(.034)	(.025)
One or both manager serve on committ	0.019	0.002	0.0097	-0.008	-0.0055	0.021	-0.018	0.013	-0.028	0.021
	(.014)	(.012)	(.017)	(.014)	(.014)	(.012)	(.014)	(.013)	(.018)	(.022)
Household Adult Equivalence Scale (*	0.028	0.092	0.0013	0.12	0.0075	0.09	-0.046	0.018	-0.048	-0.098
	(.05)	(.04)	(.048)	(.044)	(.076)	(.045)	(.019)	(.034)	(.066)	(.05)
Average Shocks on Other Plots in Household:										
Low Early Rain * Avg Soil	0.086	0.07	0.083	0.065	0.098	0.075	0.079	0.076	-0.0043	0.011

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
	(.035)	(.025)	(.036)	(.02)	(.079)	(.0092)	(.048)	(.018)	(.05)	(.043)
Low Early Rain * Poor Soil	0.41	-0.036	0.23	0.068	0.37	-0.11	0.66	-0.082	0.43	-0.15
	(.14)	(.073)	(.08)	(.16)	(.36)	(.2)	(.16)	(.049)	(.29)	(.11)
Low Early Rain * Missing Soil	-0.21	0.029	-0.2	-0.013	-0.32	-0.059	-0.094	0.034	0.1	0.047
	(.093)	(.074)	(.18)	(.11)	(2.73)	(.038)	(.3)	(.14)	(.15)	(.11)
Flood*Avg Soil	0.0015	-0.0022	0.016	-0.0093	-0.00018	-0.0013	-0.01	-0.0046	-0.027	0.0047
	(.0098)	(.0097)	(.013)	(.013)	(.018)	(.0058)	(.0085)	(.0044)	(.016)	(.021)
Flood*Poor Soil	-0.091	0.041	-0.039	0.022	-0.081	0.056	-0.19	0.04	-0.15	0.018
	(.06)	(.034)	(.078)	(.092)	(.13)	(.048)	(.14)	(.079)	(.19)	(.074)
Flood*Missing Soil	0.27	0.12	0.33	0.13	0.22	0.14	0.21	0.16	-0.12	0.029
	(.069)	(.048)	(.098)	(.11)	(2.71)	(.035)	(.21)	(.12)	(.12)	(.12)
High Early Rain * Avg Soil	-0.000015	0.000009	-3.4E-06	0.000018	-0.000038	1.5E-06	0.000012	0.000015	0.000016	-0.0000029
	(.000023)	(.00002)	(.000028)	(.000026)	(.000026)	(.000019)	(.000029)	(.00002)	(.000034)	(.000025)
High Early Rain * Poor Soil	-0.000099	-0.000078	-0.00005	0.000028	-0.00013	4.4E-06	-0.000073	-0.00012	-0.000023	-0.00015
	(.000077)	(.000068)	(.000087)	(.000054)	(.0001)	(.000064)	(.000096)	(.000056)	(.0001)	(.000094)
High Early Rain * Other Soil	-0.00052	-0.00053	-0.00089	-0.00047	-0.00061	-0.00052	-0.00025	-0.00061	0.00064	-0.00014
	(.00036)	(.00011)	(.000031)	(.087)	(.00012)	(.00002)	(.000038)	(.000094)	(.0039)	(.0025)
High Early Rain * Missing Soil	0.0011	-0.0001	0.00094	-0.000034	0.00083	-0.00028	0.0006	0.0001	-0.00034	0.00013
	(.00028)	(.00023)	(.0003)	(.00021)	(.00026)	(.00018)	(.00026)	(.00019)	(.00056)	(.00025)
Adverse shock	-0.0011	0.00054	-0.00083	0.00031	-0.00078	0.00029	-0.0012	0.00052	-0.0004	0.00021
	(.00038)	(.00028)	(.00041)	(.0003)	(.00034)	(.00023)	(.00032)	(.00025)	(.00056)	(.00043)

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Average Shocks on Other Plots in Village:										
Drought*Avg Soil	0.0022	0.0011	0.002	0.0011	0.0021	0.00097	0.0017	0.00078	-0.00033	-0.00031
	(.00038)	(.00029)	(.00048)	(.00038)	(.00039)	(.00029)	(.00038)	(.00029)	(.00048)	(.00039)
Drought*Poor Soil	0.0031	-0.0035	0.0023	-0.0029	-0.00064	-0.0038	-0.000009	-0.0048	-0.0023	-0.0019
	(.0012)	(.00091)	(.0022)	(.0012)	(.001)	(.00092)	(.0013)	(.00095)	(.0019)	(.0016)
Drought*Missing Soil	0.0058	-0.0024	0.006	-0.00077	0.0056	-0.0034	-0.00045	-0.0033	-0.0064	-0.0025
	(.0024)	(.0019)	(.0027)	(.0023)	(.0024)	(.0015)	(.0014)	(.0019)	(.0031)	(.0019)
Flood*Avg Soil	-0.038	-0.0041	-0.051	-0.011	-0.036	-0.0055	-0.021	0.01	0.029	0.021
	(.0093)	(.0071)	(.012)	(.0096)	(.012)	(.0078)	(.011)	(.0083)	(.015)	(.012)
Flood*Poor Soil	-0.072	-0.0087	-0.036	-0.018	-0.021	0.016	-0.12	0.034	-0.087	0.052
	(.032)	(.037)	(.037)	(.058)	(.024)	(.047)	(.064)	(.024)	(.056)	(.039)
Flood*Missing Soil	0.082	0.029	0.14	0.037	0.062	0.01	0.038	0.041	-0.099	0.0039
	(.035)	(.027)	(.046)	(.054)	(.055)	(.025)	(.023)	(.028)	(.046)	(.038)
Low Early Rain * Avg Soil	0.0039	0.00029	0.0073	0.0012	0.003	0.00021	0.0012	-0.0034	-0.0062	-0.0046
	(.0025)	(.002)	(.0034)	(.0031)	(.0035)	(.0025)	(.0033)	(.0021)	(.0046)	(.004)
Low Early Rain * Poor Soil	0.017	0.021	0.0065	0.039	0.014	0.021	0.044	0.0025	0.038	-0.036
	(.018)	(.017)	(.024)	(.029)	(.011)	(.016)	(.025)	(.015)	(.023)	(.019)
Low Early Rain * Missing Soil	-0.018	-0.041	-0.045	-0.029	-0.01	-0.037	-0.0022	-0.057	0.043	-0.028
	(.019)	(.014)	(.036)	(.046)	(.035)	(.012)	(.016)	(.012)	(.022)	(.022)
High Early Rain * Avg Soil	3.5E-06	2.4E-06	6.8E-06	6.1E-06	0.0000041	2.4E-06	-6.8E-06	-2.4E-06	-0.000014	-0.0000085

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
	(.000003)	(.000003)	(.000004)	(.000004)	(.000004)	(.000002)	(.000004)	(.000002)	(.000004)	(.000004)
High Early Rain * Poor Soil	0.000039	-0.000003	0.000035	-7.7E-06	0.000014	-0.00002	0.000022	-0.000016	-0.000013	-0.0000085
	(.000019)	(.000015)	(.000025)	(.00002)	(.000019)	(.000015)	(.000022)	(.000016)	(.000024)	(.00002)
High Early Rain * Other Soil	0.00034	0.00034	0.00031	0.00038	0.00032	0.00033	0.00034	0.00024	0.000023	-0.00013
	(.0001)	(.000075)	(.000034)	(.00049)	(.000068)	(.000016)	(.00002)	(.000093)	(.00019)	(.00011)
High Early Rain * Missing Soil	0.00012	-0.000067	0.000091	-0.00007	0.000062	-0.000013	0.00018	-0.000043	0.000087	0.000027
	(.000055)	(.000042)	(.00006)	(.000048)	(.000049)	(.000033)	(.000048)	(.000037)	(.00007)	(.000063)
EVI*Avg Soil in Village	-0.000041	0.000022	-0.000057	5.7E-06	-0.000044	6.6E-06	3.9E-06	0.000022	0.000061	0.000016
	(.000021)	(.000018)	(.00003)	(.000023)	(.000026)	(.000016)	(.000025)	(.000017)	(.000028)	(.000025)
EVI*Poor Soil in Village	-0.00063	-0.000086	-0.00064	-0.000059	-0.00033	0.00002	-0.00038	0.000083	0.00026	0.00014
	(.00014)	(.00011)	(.00022)	(.00014)	(.00013)	(.00012)	(.00017)	(.00012)	(.00019)	(.00015)
EVI*Missing Soil in Village	0.021	-0.00052	0.018	-0.0035	0.048	-0.00058	0.081	-0.000032	0.063	0.0035
	(.0029)	(.0013)	(.0024)	(.0032)	(.0099)	(.00046)	(.0072)	(.0012)	(.01)	(.0032)
Adverse Shock	0.0012	0.00055	0.0014	0.0012	0.0015	0.00077	0.0023	0.00024	0.00087	-0.001
	(.00048)	(.00031)	(.00061)	(.00053)	(.00044)	(.00031)	(.00046)	(.00018)	(.00065)	(.0005)
Own Plot Shocks:										
Drought*Avg Soil	0.026	0.027	0.038	0.025	0.024	0.022	0.018	0.036	-0.02	0.011
	(.0058)	(.0049)	(.0064)	(.0062)	(.0057)	(.0049)	(.0059)	(.0051)	(.0077)	(.0081)
Drought*Poor Soil	0.041	0.036	0.042	0.031	0.042	0.024	0.021	0.017	-0.021	-0.014
	(.013)	(.0098)	(.012)	(.0094)	(.014)	(.0097)	(.014)	(.012)	(.016)	(.017)

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Drought*Missing Soil	0.019	-0.011	0.006	-0.02	-0.0015	0.016	0.007	0.01	0.001	0.03
	(.026)	(.02)	(.04)	(.023)	(.028)	(.015)	(.026)	(.012)	(.04)	(.022)
Flood*Avg Soil	-0.036	-0.048	-0.065	-0.04	-0.044	-0.04	-0.02	-0.048	0.044	-0.0086
	(.02)	(.021)	(.021)	(.03)	(.018)	(.025)	(.013)	(.026)	(.029)	(.041)
Flood*Poor Soil	-0.14	0.099	0.074	0.092	-0.0077	0.0088	-0.16	-0.015	-0.24	-0.11
	(.099)	(.074)	(1.65)	(.15)	(.37)	(.065)	(.13)	(.13)	(.34)	(.17)
Flood*Missing Soil	-0.63	-0.3	-1.09	-0.24	-0.32	-0.38	-0.65	-0.56	0.44	-0.32
	(.21)	(.13)	(.5)	(.22)	(.76)	(.12)	(.9)	(.71)	(.52)	(.25)
High Early Rain * Avg Soil	-0.00018	8.2E-06	-0.00017	-0.000038	-0.000086	-0.000038	-0.00024	-0.000066	-0.000065	-0.000028
	(.000075)	(.000066)	(.000094)	(.0001)	(.000088)	(.000065)	(.000098)	(.000068)	(.000075)	(.000092)
High Early Rain * Poor Soil	-0.0002	0.00022	0.000023	-0.000097	0.00002	0.000065	-0.00028	0.00023	-0.0003	0.00033
	(.00021)	(.00018)	(.00029)	(.00021)	(.00019)	(.00018)	(.00025)	(.00019)	(.00032)	(.00023)
High Early Rain * Other Soil	-0.0013	0.00029	-0.0018	-0.00073	-0.0023	0.0011	-0.00058	0.0014	0.0012	0.0021
	(.0019)	(.00076)	(.26)	(1.03)	(.029)	(.012)	(.00026)	(.19)	(.031)	(.014)
High Early Rain * Missing Soil	-0.0028	0.0018	-0.0029	0.0012	-0.0015	0.0016	-0.0011	0.0016	0.0018	0.00039
	(.00086)	(.00063)	(.0012)	(.00057)	(.0004)	(.0008)	(.00068)	(.00063)	(.0015)	(.0012)
EVI*Avg Soil	0.00063	0.00066	0.00025	0.00076	0.00056	0.00096	0.0015	0.00097	0.0013	0.00021
	(.00054)	(.00048)	(.00065)	(.00069)	(.00062)	(.00047)	(.00071)	(.00049)	(.00065)	(.00068)
EVI*Poor Soil	0.0018	-0.0021	-0.0015	-0.0002	0.0029	-0.00082	0.0025	-0.0019	0.004	-0.0017
	(.0015)	(.0012)	(.0022)	(.0017)	(.0014)	(.0012)	(.002)	(.0013)	(.0022)	(.0016)
EVI*Missing Soil	0.0065	-0.011	0.0073	-0.0081	0.002	-0.0086	0.006	-0.0065	-0.0013	0.0016

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
	(.0052)	(.0043)	(.0073)	(.0047)	(.0032)	(.0053)	(.0031)	(.0038)	(.0079)	(.0087)
soil_type==2	-0.0076	-0.016	-0.016	-0.0061	0.013	-0.0096	0.0096	-0.0061	0.025	-0.000035
	(.012)	(.0093)	(.014)	(.012)	(.013)	(.0098)	(.013)	(.0098)	(.015)	(.019)
soil_type==3	-0.0018	-0.031	0.012	-0.029	0.011	-0.031	0.011	-0.023	-0.0011	0.0063
	(.014)	(.012)	(.017)	(.016)	(.016)	(.012)	(.016)	(.013)	(.015)	(.014)
soil_type==4	-0.052	0.018	-0.051	0.0013	-0.085	-0.015	-0.053	0.016	-0.0018	0.015
	(.025)	(.02)	(.032)	(.026)	(.032)	(.023)	(.032)	(.025)	(.037)	(.035)
soil_type==6	0.093	0.12	0.056	0.11	0.028	0.13	0.12	0.17	0.06	0.061
	(.023)	(.02)	(.039)	(.025)	(.024)	(.02)	(.025)	(.02)	(.034)	(.031)
soil_type==99999	0.13	0.045	0.17	-0.087	0.023	0.078	0.045	0.14	-0.13	0.23
	(.083)	(.086)	(.078)	(.045)	(.048)	(.039)	(.057)	(.13)	(.12)	(.16)
soil_quality==2	-0.015	-0.073	0.015	-0.055	-0.033	-0.059	-0.019	-0.072	-0.035	-0.016
	(.024)	(.02)	(.029)	(.026)	(.026)	(.021)	(.029)	(.022)	(.025)	(.024)
soil_quality==3	-0.21	-0.16	-0.18	-0.15	-0.32	-0.12	-0.072	-0.13	0.11	0.023
	(.067)	(.051)	(.07)	(.072)	(.082)	(.06)	(.1)	(.048)	(.07)	(.062)
soil_quality==5	0.97	0.08	0.94	0.39	0.2	0.14	0.81	-0.26	-0.13	-0.65
	(.4)	(.082)	(141.2)	(130.1)	(6.45)	(1.18)	(.11)	(106.2)	(5.93)	(7.25)
soil_quality==99999	0.59	0.33	0.59	0.35	0.5	0.054	0.55	0.033	-0.037	-0.32
	(.41)	(.21)	(.38)	(.18)	(.26)	(.3)	(.33)	(.2)	(.73)	(.37)
water_source==2	-0.14	-0.0089	-0.13	-0.063	-0.12	-0.024	-0.21	0.019	-0.082	0.082
	(.041)	(.029)	(.068)	(.035)	(.036)	(.027)	(.072)	(.021)	(.086)	(.038)

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
water_source==3	-0.22	-0.0035	-0.15	-0.094	-0.21	-0.055	-0.38	0.032	-0.22	0.13
	(.054)	(.042)	(.082)	(.055)	(.056)	(.037)	(.09)	(.044)	(.12)	(.057)
water_source==99999	-0.48	-0.48	-0.77	-0.35	-0.74	-0.47	-0.91	-0.32	-0.15	0.024
	(.23)	(.19)	(.11)	(.16)	(.055)	(.049)	(.18)	(.41)	(.38)	(.23)
slope==2	0.0091	-0.037	0.023	-0.031	0.039	-0.0081	0.07	-0.012	0.047	0.018
	(.02)	(.015)	(.031)	(.02)	(.021)	(.016)	(.022)	(.016)	(.026)	(.016)
slope==3	-0.04	0.012	-0.059	0.013	-0.045	0.018	0.0026	0.018	0.062	0.0044
	(.019)	(.014)	(.031)	(.019)	(.02)	(.015)	(.021)	(.015)	(.025)	(.021)
slope==4	-0.069	0.016	-0.13	-0.032	-0.091	0.0092	-0.025	0.071	0.11	0.1
	(.033)	(.025)	(.043)	(.033)	(.035)	(.029)	(.045)	(.028)	(.065)	(.042)
slope==5	0.075	0.055	0.015	0.037	0.031	0.055	0.13	0.076	0.12	0.039
	(.039)	(.028)	(.039)	(.033)	(.05)	(.026)	(.064)	(.032)	(.055)	(.032)
slope==6	-0.29	0.53	-0.64	0.79	-0.55	0.69	-0.3	0.49	0.33	-0.3
	(.29)	(.19)	(73.2)	(.33)	(76.6)	(.029)	(.052)	(.036)	(.6)	(.44)
slope==99999	0.4	0.027	0.58	-0.016	0.55	0.23	0.47	-0.014	-0.11	0.0017
	(.24)	(.16)	(.31)	(.24)	(.15)	(.24)	(.071)	(.41)	(.36)	(.27)
erosion==2	-0.02	-0.028	-0.024	-0.039	-0.0097	-0.028	-0.06	-0.025	-0.037	0.014
	(.013)	(.01)	(.017)	(.013)	(.014)	(.011)	(.015)	(.011)	(.021)	(.011)
erosion==99999	-0.13	-0.011	-0.0032	0.019	-0.059	0.0035	-0.19	-0.064	-0.19	-0.083
	(.12)	(.09)	(.24)	(.1)	(.069)	(.19)	(.21)	(.13)	(.25)	(.14)

Appendix Table A4b: OLS and Quantile Regression Determinants of Land and Labor Inputs in Uganda

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS		25th percentile		50th percentile		75th percentile		Interquartile Range	
	Land	Labor	Land	Labor	Land	Labor	Land	Labor	Land	Labor
Extension services	0.16	0.052	0.16	0.064	0.15	0.051	0.11	0.036	-0.051	-0.028
	(.011)	(.0095)	(.014)	(.012)	(.013)	(.0094)	(.012)	(.01)	(.015)	(.015)
Constant	0.00	0.00	-0.53	-0.37	0.019	0.059	0.55	0.43	1.08	0.8
	(.0048)	(.0038)	(.023)	(.021)	(.023)	(.0042)	(.006)	(.0078)	(.0091)	(.0063)
F statistic; see note #.	23	16.7	55.7	27.2	28.5	67.5	30.4	59.4		
Corresponding p value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
F statistic; see note §.									45.9	14.5
Corresponding p value									0.00	0.00

Standard errors in parentheses

#F statistic for joint significance of variables used as production function instruments in Table 5b.

§F stat for h0 – coefficients of instruments equal for 25th and 75th percentile.

Appendix Table A5a: Tanzania Production Function Estimates

	Tanzania	
	2SLS	IVCRC
Land	0.76	0.57
	(0.15)	(0.01)
Labor	0.21	0.37
	(0.23)	(0.03)
Land Value	0.00	0.03
	(0.02)	(0.01)
Land Value Missing	0.14	0.09
	(0.08)	(0.10)
Distance Home	0.00	0.00
	(0.00)	(0.00)
Distance to Road	-0.02	-0.02
	(0.00)	(0.00)
Good Soil	0.14	-4.55
	(0.32)	(0.60)
Average Soil	-0.17	-4.86
	(0.33)	(0.55)
Sandy Soil	0.47	5.88
	(0.88)	(3.28)
Loamy Soil	0.84	6.46
	(0.91)	(3.29)
Clay Soil	0.51	6.60
	(0.96)	(3.25)
Single Manager	-0.05	-0.01
	(0.03)	(0.01)
Poor Health	-0.03	-0.03
	(0.01)	(0.00)
Missing Health	-0.11	-0.15
	(0.05)	(0.05)
Illiterate Manager	-0.06	-0.08
	(0.04)	(0.02)
Literacy Missing	0.07	0.13
	(0.30)	(1.40)
Male Manager	-0.06	0.00
	(0.03)	(0.01)

Appendix Table A5a: Tanzania Production Function Estimates

	Tanzania	
	2SLS	IVCRC
Manager Age	0.00	0.00
	(0.00)	(0.00)
Age Missing	3.66	4.01
	(1.02)	(0.52)
Crops Lost	0.07	0.07
	(0.03)	(0.01)
Bad Shock	-0.27	-0.27
	(0.03)	(0.01)
EVI*Good Soil	0.14	0.01
	(0.54)	(0.46)
EVI*Average Soil	0.51	0.37
	(0.58)	(0.31)
EVI*Poor Soil	0.00	-8.67
	(0.63)	(1.34)
EVI*Loamy Soil	-0.58	-0.94
	(0.32)	(0.32)
EVI*Clay Soil	0.03	-1.35
	(0.59)	(0.31)
EVI*Other Soil	1.11	12.37
	(1.65)	(5.68)
Drought/flood Severity	-0.07	-0.05
	(0.03)	(0.01)
Crop Disease Severity	0.02	0.03
	(0.02)	(0.01)
Water Shortage	-0.07	-0.06
	(0.03)	(0.02)
Constant	0.00	0.03
	(0.00)	(0.04)

Notes: Bootstrapped standard errors (50 bootstrap iterations) in parentheses.

Appendix Table A5b: Uganda Production Function Estimates

	Uganda	
	2SLS	IVCRC
Land	0.70	0.53
	(0.05)	(0.00)
Labour	0.14	0.38
	(0.10)	(0.00)
Drought*Avg Soil	-0.03	-0.03
	(0.01)	(0.00)
Drought*Poor Soil	-0.04	-0.05
	(0.02)	(0.01)
Drought*Missing Soil	0.00	-0.01
	(0.03)	(0.05)
Flood*Avg Soil	0.01	-0.05
	(0.03)	(0.03)
Flood*Poor Soil	0.26	0.46
	(0.31)	(0.63)
Flood*Missing Soil	-0.22	1.16
	(0.17)	(0.41)
High Early Rain * Avg Soil	0.00	0.00
	(0.00)	(0.00)
High Early Rain * Poor Soil	0.00	0.00
	(0.00)	(0.00)
High Early Rain * Other Soil	0.00	-0.04
	(0.00)	(0.03)
High Early Rain * Missing Soil	0.00	0.00
	(0.00)	(0.00)
EVI*Avg Soil	0.00	0.00
	(0.00)	(0.00)
EVI*Poor Soil	0.00	0.00
	(0.00)	(0.00)
EVI*Missing Soil	0.00	0.00
	(0.00)	(0.00)
soil_type==2	0.00	0.03
	(0.01)	(0.01)
soil_type==3	0.02	0.02
	(0.02)	(0.00)
soil_type==4	0.02	0.01
	(0.02)	(0.00)
soil_type==6	0.01	-0.03

Appendix Table A5b: Uganda Production Function Estimates

	Uganda	
	2SLS	IVCRC
	(0.04)	(0.02)
soil_type==99999	-0.02	-0.01
	(0.04)	(0.00)
soil_quality==2	-0.24	-0.34
	(0.11)	(0.14)
soil_quality==3	-0.13	-0.11
	(0.03)	(0.00)
soil_quality==5	0.07	0.04
	(0.09)	(0.03)
soil_quality==99999	-1.09	0.51
	(0.61)	(0.74)
water_source==2	-0.54	3.78
	(0.38)	(0.81)
water_source==3	0.18	0.12
	(0.06)	(0.01)
water_source==99999	0.39	0.29
	(0.08)	(0.01)
slope==2	0.52	1.32
	(0.32)	(0.53)
slope==3	0.01	0.01
	(0.03)	(0.00)
slope==4	0.08	0.07
	(0.02)	(0.00)
slope==5	0.11	0.04
	(0.04)	(0.02)
slope==6	-0.05	-0.04
	(0.05)	(0.02)
slope==99999	0.34	4.10
	(0.29)	(2.31)
erosion==2	-0.19	-5.95
	(0.27)	(0.73)
erosion==99999	0.08	0.07
	(0.02)	(0.00)

Appendix Table A5b: Uganda Production Function Estimates

	Uganda	
	2SLS	IVCRC
Male plot	0.56	0.94
	(0.18)	(0.26)
Extension	0.09	0.09
	(0.01)	(0.00)
Constant	0.09	0.12
	(0.02)	(0.00)

Notes: Bootstrapped standard errors (50 bootstrap iterations) in parentheses.