Constraints to Tanzanian Agricultural Development: Input Use and Marketable Surplus in Households Under Non-Separability

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Abstract

This paper builds on the literature testing for labor market completeness in developing countries. If households are profit maximizing, and factors of production are abundant, household production decisions should depend exclusively on a vector of input prices and plot characteristics. Empirical tests using a panel data survey from Tanzania reject labor market completeness. Further tests for the efficient allocation of manure among plots, and on household's marketable surplus also reject, revealing that agricultural households face considerable constraints in factor markets and in marketing output. The rejections are all robust to the inclusion of heterogenous household effects, and village-specific shocks. I incorporate high-resolution annual population estimates from the LandScan database, which uses satellite imagery to construct population estimates, and find that in areas with higher population density, less family labor is used and more hired labor is used. Child labor use is also examined using within-sample predictions from the empirical model of labor demand. Based on the results of this exercise, child labor use is suspected to be heavily under-reported.
JEL Codes J1, J43, O12, Q10, Q12, Q13, Q16

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1 Introduction

Smallholder farms still account for a large share of labor in developing countries, and in many countries a substantial portion of this labor is provided by family members. Starting with the work by Chayanov (1965), analysis of agricultural households' behavior dates back decades in the empirical microeconomics literature. An important book by Singh et al. (1986) synthesized several works on agricultural household models; other contributions include notable papers written by Amartya Sen (1966), Alain de Janvry, and Elisabeth Sadoulet (Key et al., 2000), Dwayne Benjamin (1992), Marcel Fafchamps (1992), and agricultural household models were conceived in order to evaluate households responsiveness to price changes since often households may not sell output to the market. Agricultural models typically include a household consumption or utility function, as well as profit or production functions for household productive activities including farming, animal husbandry, small-business income and other activities. A thorough description of agricultural household models and their development is included in Taylor and Adelman (2003).

There is a substantial body of literature now analyzing market access or ”market completeness” issues across many countries. For example, if we say that labor markets are incomplete, it is implied that households must rely on family members to provide agricultural and other business labor, which reflects that their demand for quality hired labor is going unmet. In contrast, if markets were complete and farmers are profit maximizing, farm decisions about hired labor and other input use would be determined exclusively by farm characteristics and input prices including wages.

The key unifying concept of this paper is referred to as the *separation* of production and household consumption, and this is idea sometimes used interchangeably with market completeness. What is meant with respect to separability is that the household consumption decisions do not rely on production and vice versa. In cases where the budget or resource constraint of the household is affected by the amount and quality of family labor provided, we can say that production and consumption are non-separable. If household consumption is separable from agricultural production, production decisions should only reflect plot characteristics and market conditions, including prices and weather variability. If, on the other hand, household production decisions rely on household parameters, such as the number of residents in the household, the wealth of the household, the number of livestock in the household's herd, the level of fitness of the residents of that household, or their consumption levels, then we must estimate both consumption and production jointly in order to yield consistent results. An F-test of the exclusion restriction of all household parameters, or simply a T-test of any coefficient on household characteristics, may be interpreted as tests for the presence of complete labor markets; if household production still relies principally on family labor, tests for the effects of household demographics on household production should yield a significant result.

This paper makes several contributions. First, this work advances the literature on input use in non-separable contexts, Tanzania, and builds on past work in Benjamin (1992) and recent work in LaFave and Thomas (2016). Important differences exist between the Tanzania and Indonesia including but not limited to geography, differences in asset markets, and the use of livestock as an asset class in Tanzania, illustrated in the seminal work by Dercon (1998). The Tanzania LSMS dataset includes over 21,000 plots, 15,000 household-year observations. All rejections are robust to the inclusion household/farm fixed effects and village-wave fixed effects so that the effects on input demand and marketed surplus being identified are only the result of within-household changes. In contrast to the original work by Benjamin (1992) and similar to the result in LaFave and Thomas (2016), I reject completeness of labor markets across all specifications.

As a result of the high level of detail of the dataset, controls for managerial human capital are included with the plot-level estimates. I find that collective plot management leads to higher levels of family labor use per plot. I explore how labor market conditions affect family labor use on plots by proxying for the labor market capacity with a population density variable. This exercise takes advantage of LandScan fine-grain resolution population data available annually for the entire globe. LandScan adds the most value in countries with low frequency or low-quality survey or census data, such as Tanzania and other sub-Saharan African nations. To my knowledge this is the first paper to use this particular dataset to measure the effects of population density on labor markets. Where the log of population density is also used as an independent variable, I argue that population density low or near zero it is unlikely that complete labor markets exist, whereas if population density is higher than 2, a sufficient condition exists for labor markets.

Child labor in Tanzania, which appears to be much higher than that reported in Indonesia, is examined and under-reporting of labor use by children is suspected based on within-sample predictions using the empirical model estimated here. Using this setup, I find some evidence of substitution between child labor and hired labor.

This paper is a synthesis of strategies from several different papers. The main inspiration for this paper is the original empirical work by Benjamin (1992) which explored rice-growing farms in 1980's Indonesia. Following the basic framework in his paper, this paper examines household participation in functioning labor markets. As is argued in Benjamin (1992), market prices and wages should function as indicators if markets are complete and efficient, which should lead to a detectable separation between household productive and consumption activities. Benjamin (1992) refers to this as 'the neoclassical model's ability to distinguish between supply and demand'.

According to a paper by Grimard (2000), endogeneity of household demographics and composition to agricultural decisions is a significant concern in the context of Cote d'Ivoire where large kinship networks facilitate the movement of family members to and from regions in need of agricultural labor. In Tanzania, by contrast, the large distances make this type of movement, I argue, much less of a concern, though I employ robustness checks to ensure that endogeneity of household demographics is not biasing my estimates. Carter and Yao (2002) is another important empirical paper that explores the effect of land tenancy on production decisions in Chinese agricultural households, and the authors remind the readers of the importance of analyzing sub-sets of the data to make sure that global separability rejections do not mask heterogenous effects for different households. This will be discussed further in the robustness checks section.

A second strategy I employ in understanding Tanzanian agricultural households is to analyze intensity of input use in the form of organic fertilizer. Organic fertilizer is much more abundant and accessible in Tanzania than chemical fertilizers, as organic fertilizer is simply an output from livestock kept by many farms. Similar to Gavian and Fafchamps (1996), I regress organic fertilizer use per acre on household and plot characteristics. Organic fertilizer is considered a short term investment since it's benefits may last longer than one cropping season (Gavian and Fafchamps, 1996). If markets for organic fertilizer inputs are functioning and complete, returns to fertilizer should be equalized across all plots conditional on plot characteristics, crop choice, and weather. Although organic fertilizer is too bulky to transport, at least in the West African context overnight paddocking contracts have been documented. Gavian and Fafchamps (1996) find that land holdings per household member negatively influenced organic fertilizer use per hectare, and that organic fertilizer use was largely determined by the size of the livestock holdings of the household.

As a final strategy, I adapt the approach in Barrett and Dorosh (1996) where the authors use Madagascar data to explore the effect of changes in rice prices on agricultural household's welfare in Madagascar by analyzing marketable surplus. They find that wealth indeed influences marketable surplus, and that price shocks have negative effects on households who are neither net sellers nor net buyers of rice.

The rest of the paper will be organized as follows: section 2 lays out the dataset and the summary statistics of Tanzanian agricultural households and their farms. Section 3 explains the methodology and analyzes the results including robustness checks. Section 4 assesses the possibility that child labor is being under reported in the data, and section 5 concludes.

2 Data

The data used are from the World Bank's Living Standards Measurement Survey (LSMS) instrument from Tanzania, which includes a substantial agricultural component captured over 4 waves from 2008-2015. All waves of data are freely available from several sources including the World Bank website and the website of the Tanzanian National Bureau of Statistics. Data were collected on basic household demographic characteristics, and the questionnaire included modules on labor, consumption, assets, and anthropometric data for household members. Agricultural data were recorded separately, but at the same sitting for the two agricultural seasons experienced in some parts of Tanzania. For the two separate seasons, locally referred to as the "short rainy season" and the "long rainy season" plot inputs are are recorded as one observation per year, though outputs are recorded separately and summed across seasons for our analysis.

An important feature of this dataset is that records kept at the plot level are highly detailed. Included are information on plot ownership, seed type and purchases, fertilizer use, which household member manages the plot, as well as which family members provide labor on the plot and whether or not any hired labor was used. Descriptive statistics for household demographic characteristics as well as farm assets and other characteristics can be found in Table 3.

Wave 1 of the survey was collected from September 2008 and the bulk of interviews were completed by September of the following year. The sample contains 3,265 households, including 16,709 individuals, with a median of 5 members per household. There were 5,126 plots held by 2,284 households, and 81 percent held agricultural land. The median number of plots is 2.9 plots per agricultural household with an median overall land area of 6.5 (σ =17.9)) hectares. The household head has an median age of 43, whereas the median household age is only 22.3, quite a large gap. The average adult (12-65) in a household has 5 years of schooling, and is 34 years of age. Households have a median of 2 children, 2 adult members, and a median of 0 senior members.

Wave 2 was collected from October 2010 with the majority of interviews completed by September 2011. The second wave sample contains 3,924 households, including 20,559 individuals with a median of 5 members per household. Included are 3,168 round one households, a re-interview rate of 97 percent. Households with agricultural land represent 2,630 households (67 percent) in the survey, and there are a total of 6,038 plots with a median of 3 plots per agricultural household with an average farm size of 7.7 (σ =14.6) hectares.

Collection for wave 3 began in October of 2012 with interviews nearly complete by the end of October 2013. The 3rd wave of the sample is expanded, and includes 5,010 households and 25,412 individuals with a median of 6 members per household. The households who held agricultural land were 3,300 (65 percent) with a total of 7,447 plots and 3.05 plots per agricultural household with an average farm size of 4.2 (σ =24.5) hectares.

The fourth wave of the survey sampled the same villages, but replaced the households in the sample. The interviews began in October 2014 and were completed by August 2015. It includes 3,352 households and 16,285 individuals. The median number of household members remains 6. The agricultural modules contains data on 4,275 plots with the average farm size being 7.3 (σ =12.7) hectares.

Descriptive table 1 shows both family and hired labor use at the plot level. Labor is split into harvest and preparatory periods. Family labor use is much higher than hired labor use on average. Average hired labor use in both the preparatory and harvest periods appears to be very stable across all waves.

3 Empirical Results

Plot-level Labor Demand Estimates

I do not assume that hired labor and family labor are perfect substitutes. In their paper, Deolalikar et al. (1987) test the hypothesis that family labor and hired labor are perfect substitutes using farm-level data from India and Malaysia. The authors reject heterogeneity of labor and they argue that further analysis of the sources of this heterogeneity is called for. Family labor and hired labor are therefore estimated separately here, allowing us to disentangle some of the effects that household-level controls may have on labor use both of family and hired laborers.

A household fixed effect is included, as well as a village-wave dummy to capture price or rainfall variation at the village level. The dependent variables are the log number of total family labor days, the log of total hired labor days, and the total number of family workers per plot. The regressions take the form:

$$L_{ih}^{FAM} = \beta N_{ih} + \delta X_{ih} + \epsilon_i \tag{1}$$

and similarly, hired labor:

$$L_{ih}^{HIRED} = \beta N_{ih} + \delta X_{ih} + \epsilon_i \tag{2}$$

where the error term is given the following structure:

$$\epsilon_i = \eta_h + \eta_v + \eta_t + \eta_{vt} + \zeta_{hvt} \tag{3}$$

Where N is vector of household characteristics on plot i, in household h and village v, and X is a vector of other plot characteristics. In some equations the subscripts for time and village are omitted for legibility. The structure of the error term for the fixed effects estimates is illustrated by equation 3. The error term includes one household-specific component, one time-specific component, one village-specific component, and a set of village-wave dummies. Table 4 displays the results of the OLS and FE-within transform estimations of labor demand at the plot level.

The first two columns represent the regression of family preparatory labor on the set of plot, household, and environmental control variables described above. Columns 3 and 4 represent represent the number of family workers per plot as the dependent variable, or the extensive margin of family labor at the plot level, and the last two columns show the regression of the (log of) hired labor days per plot on the set of control variables. For each column-pair the first column represents the pooled OLS estimates, and the second column the household-fixed-effects regressions. All columns contain village-wave fixed effect dummy variables, which control for things like village-specific weather and price shocks.

First examining the main variables of interest, household size, note that the number of adult household members is positive and statistically significant at the highest levels across all columns. The number of older persons has a negative effect on labor days but a positive effect on the amount of laborers listed on the plot. This suggests that labor of senior persons is being used on the farm, and perhaps under-reported in the survey. The number of children in the household has an effect on the log of preparatory labor days, but it appears to be only identified between households. The number of children is not significant in the within-household regressions, possibly because there is not enough variation within households during the survey period (children born in the beginning of the survey period are not old enough by the end of the survey period to provide any substantive labor on the farm). It is also important to note that within the sample period of the survey the median number of children per household declined from 2 to 1, and not all households have a senior member.

The log of plot-level family preparatory labor is increasing in organic fertilizer, with the effect statistically significant across all 4 columns. Organic fertilizer is decreasing in the use of hired labor, likely because hired labor is of an inferior quality (requires more supervision) than family labor. Similarly family labor is increasing in improved seed purchases, ”seed_type” variable, and decreasing in organic fertilizer use.

The log of population density is negative, and statistically significant, meaning where population is more dense, less family labor is used. Hired preparatory labor is also increasing in the log of population density, which suggests it may be a good proxy for labor market capacity. A similar result is obtained from the harvest season estimates (Table 5) of population density on family harvest labor demand.

Family preparatory labor is also decreasing in household assets, but increasing with an increase in animal units. This suggests that animals are being used as draft labor, and that family labor may be preferred to market labor for working with draft animals. This is in contrast with other countries and contexts where laborers sometimes specialize in working with draft animals ¡cite¿.

For the managerial control variables, the collective plot dummy is highly significant, increasing labor by 0.46 according to OLS estimates, and 0.42 according to the FE, significant at the highest levels.[1] Mixed-gender managers account for a decreased amount of labor, while all_female managed plots also use decreased labor. The age of the plot manager (or average age) is significant as well, with the changes also identified.

Turning to Table 5, we have the log of family harvest labor days as the dependent variable in columns 1-2, the total number of family members listed as plot workers in columns 3-4, and the regression of hired harvest labor days on the same set of controls in columns 5-6. As before, for each pair of columns, the first column represents the OLS estimates, and the second the fixed-effects within transformation. The number of children is identified as a statistically significant determinant of harvest days in column one, and more children increases the number of plot workers and decreases the amount of hired labor. This is highly suggestive that kids are being used at harvest time, and that kids and hired labor may be substitutes. The number of adult household members is strongly significant across all columns. The number of older members has a negative effect on family harvest days demanded in the POLS regressions, though the effects are not significant in the fixed-effects regressions.

As for other inputs, organic fertilizer appears to only slightly increase harvest days in column 2, though an increase in organic fertilizer corresponds with a decrease in hired labor use. This is again suggestive that hired labor is generally inferior to family labor. Intercropped status increases family harvest labor, as does seed type, although within-household increases in seed purchases correspond to a decrease in family labor. This seems difficult to explain. Harvest days are increasing in animal units as well, suggesting animals are being used as draft labor and increases in family labor must be supplied to use them.

Turning to the plot-level managerial controls, we see that collective plot status is again increasing the number of days, though the effect size is slightly smaller than that estimated in Table 4 with the preparatory labor. All female plots receive less harvest labor, as do mixed-gender plots. This effect is substantial in size, and it indicates women-managed plots may be needlessly constrained. An increase in the age or average age of plot managers corresponds to an increase in family harvest labor days as well.

[1]Note that the collective plot dummy, which is 1 if multiple plot managers are listed, and 0 otherwise, was nearly perfectly correlated with the number of plot workers. For this reason, collective plot dummies are omitted from the extensive margin labor regressions.

Robustness Checks

Due to evidence of recall bias in data collection, some of which came from Tanzania itself (Beegle et al., 2012), I have included a robustness check that adds dummies for the month in which the survey interview was conducted. These dummies are also included in all subsequent robustness checks unless otherwise noted. Table 9 shows the results of robustness check 1. The second robustness check involves excluding all labor which was conducted on the plot by household members who have recently joined the household as a measure to control against endogeneity of household composition to agricultural labor decisions. Based on the questions in the survey it is possible to identify which household members have joined the household in the past year and for what reason they have moved. In this robustness check, all labor contributions by survey participants who reported moving in the last year due to acquiring agricultural land or for work purposes are excluded. The test in this case still strongly rejects labor market completeness and the results can be found in Table 10. The third robustness check, Table 11, evaluates whether farms of different sizes have different demands for labor. Farms are broken into quantiles based on the area under control by each farm. The smallest quantile of farms are approximately less than a football field, the largest quantile farms are over ten football fields in size. All tests still reject labor market completeness, although households in the largest quantile of farms appear to be the most constrained in their labor use.

Fertilizer Factor Allocation Regressions

Fertilizer regressions represent the following estimated model:

$$M_{ih} = \beta N_{ih} + \delta X_h + \epsilon_i \tag{4}$$

where the error term is again given the following structure:

$$\epsilon_i = \eta_h + \eta_j + \eta_t + \eta_{jt} + \zeta_{hjt} \tag{5}$$

where M_{ih} the dependent variable is the log of fertilizer per acre applied to plot i in household h. N_{ih} & X_h are vectors of plot characteristics at the plot and household level. The error term is again given the same structure with dummy variables for household and village-wave included.

Results from the regression of the log of fertilizer per acre on plot and household control variables are shown in Table 6 . Columns 1-2 are pooled OLS and FE-within respectively. Columns 3 and 4 are the same regression, this time including the value of animal portfolio holdings in the place of animal units. As the animal units variable is more likely to be correlated with fertilizer use (often livestock is left overnight on the field for the purposes of fertilizing), this offers the advantage of representing the value of the stock while hopefully being less endogenous. Columns 5-6 mirror 3 and 4, but with fixed effects now included at the village level for the purposes of leveraging the full dataset.

The number of children is negative and strongly significant across all columns, indicating children and organic fertilizer are, potentially, substitutes. Rented plots receive less fertilizer, and irrigated plots receive much less fertilizer as well. The fact that the coefficient of rented plots is statistically significant confirms also the results of Gavian and Fafchamps (1996) who find that tenure status affects manuring in Niger. Also similar to their findings, in my estimates area planted to other plots as well as plot distance to household are significant and negative, indicating the "stretching" of limited manure resources across all plots. Further, animal assets and portfolio assets are strongly significant. This again reflects the findings in Gavian and Fafchamps (1996) , application of manure is mostly determined by the amount of livestock in a household's herd.

Organic fertilizer use per acre is increasing in the log of population density, and plot_slope.

Interestingly intercropped plots receive less fertilizer per acre this is indicative of intercropping improving soil health, and so less fertilizer application is required. Fertilizer use is increasing in the use of improved seeds, which is very interesting, implying the two are complimentary.

All of the asset variables are strongly significant, though the magnitude varies with HH assets having the largest effect on fertilizer per acre. Interestingly, gender is not a statistically significant determinant of organic fertilizer use per acre, although the age of the plot manager as well as the log years of education of the manager and plot workers do have a significant and positive effect on the intensity of fertilizer use.

Marketable Surplus Regressions

Table 7 contains the results of the procedure regressing the log of marketable surplus per acre planted on control variables. The estimated equation is the following:

$$Y_h = \beta X_h + u_h \tag{6}$$

where Y_h is total value of marketed surplus and X_h is a vector of household and farm characteristics, some households do not market any surplus. In the case that there are some potential nonlinearities a probit model is presented first in Table 7, column 1, where the outcome variable takes 1 if the household marketed a surplus, and 0 otherwise. Columns 2-3 are the OLS and within-FE regression of the log of marketed surplus on control variables. Columns 4-5 are the marketed surplus from tree crops, OLS and FE., and columns 6-7 are total marketed surplus, this time with fixed effects at the village level.

The number of adult members has a strong negative and statistically significant effect across all columns, and the effect size is pretty similar across all estimates. Population density has, interestingly, a negative effect on market surplus. Gender of the household head has a strong and negative effect on marketable surplus, while animal assets has a positive effect. Farm assets also have a positive effect. Higher levels of household assets generally correlate with lower marketed surplus per acre, but an increase in household assets is associated with an increase in marketed surplus.

4 Under-reporting of Child Labor

I use the three coefficients from the POLS prep labor and harvest labor estimations to reconstruct the amount of child labor days, adult labor days, and senior labor days provided to each plot by the household. I then use the matched plot roster data compare the number of plots predicted to use family labor with those that actually report using family labor. Since we have a log-log model, in order to back out the number of days, we must take the exponential after multiplying the coefficient with the log number of household members in a given group:

$$L_i = e^{\beta * log\_num\_children} \tag{7}$$

Table 7 presents these results, with the left column showing the number of plots on which labor was under-reported, and on the right, the number of plots which were over reported. In the preparatory period, 15,550 plots under-reported child labor according to our model, versus 1,289 plots over-reporting. For adult preparatory labor, only 81 plots had under-reported versus 4,744 plots over-reporting. Last, senior persons plot days appear to be heavily over reported according to my model with 3,250 plots under reporting versus 17,278 plots over-reporting. The same pattern follows roughly for the harvest days predicted by the model versus those actually listed in the plot rosters. Because the coefficient on the number of senior persons in the household is negative, this implies that more senior persons results in fewer total labor days. Based on the model's output, comparing under reported vs over reported labor, it seems apparent that child labor has been drastically under-reported.

5 Conclusion

This paper uses high-quality panel data from Tanzania to test for labor market completeness. In all specifications the test rejects the completeness of labor markets, and confirms the non-separable nature of household production and consumption decisions. This paper echoes findings of other recent work, including LaFave and Thomas (2016), who rejected labor market completeness using nearly identical tests in Indonesia. Analyzing household firm and consumption behavior, particularly of rural farm households, has important implications for a country's overall development status, and rural labor markets dysfunction may have important knock-on effects with respect to rural-urban migration (LaFave and Thomas, 2016). I check for the under-reporting of child labor and find evidence that labor was likely not correctly reported. Under-reporting of child labor use is a serious concern, and future research, particularly research using child labor as the dependent variable or a main variable of interest, should take steps to more precisely record labor input use.

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Table 1: Labor Use Per Plot

	Labor Days per Plot	Labor Days per Acre	Labor Days per Hectare
child prep days	0.7	0.7	0.3
adult prep days	37.8	37.7	15.3
old prep days	3.4	3.5	1.4
hired prep days	3.8	3.5	1.4
child harv days	0.5	0.5	0.2
adult harv days	18.2	19.0	7.7
old harv days	1.3	1.3	0.5
hired harv days	1.5	1.4	0.6

Table 2: Summary Statistics of Regression Variables

VARIABLES	N	mean	s.d.	min	max
mgr_is_head	18184	1.00	0	1	1
organic_fert	2168	926.40	1891	2	32000
dist_to_hh	14747	4.42	4.34	0.01	18.00
seed_type	8593	1.44	0.59	1	3
soil_type	21282	2.05	0.67	1	4
soil_quality	21282	1.62	0.59	1	3
plot_slope	21239	1.74	0.99	1	4
irrigated	21281	1.98	0.14	1	2
plot_value (in 10,000 2015 TSH)	21242	353	6604	0	827300
rented_in	809	1	0	1	1
value_all_other_plots (in 10,000 2015 TSH)	20162	523	4979	0	345100
area_planted_op	13100	7	12.27	0	339
all_female	4257	1	0	1	1
mixed_gend_mgr	9236	1	0	1	1
collective_plot	9773	1	0	1	1
educ_mgr	21284	11.75	7.94	1	46
age_mgr	21284	41.64	19.41	1	100
bmi_mgr	21284	76.81	834.10	1	20001
intercropped	21228	1.48	0.50	1	2
area_planted	21234	3.27	9.55	0	400
plot_expense	10763	87872	261249	2	7600000
age_hh_head	21315	48.63	15.42	16	108
educ_hh_head	21315	4.94	3.93	0	22
gender_hh_head	21315	0.78	0.42	0	1
num_children	21315	2.15	1.89	0	26
num_adult_members	21315	2.38	1.39	0	20
num_old_members	21315	0.27	0.55	0	3
hh_death	21315	0.10	0.30	0	1
animal_units	16456	5.12	26.93	0	527
farm_assets (in 10,000 2015 TSH)	21315	501	6408	0	333800
hh_assets (in 10,000 2015 TSH)	21315	892	11050	0	590900
density	16428	306	2392	0	77028

Table 3: Household Summary Statistics

VARIABLES	N	mean	sd	min	max
num_hh_members	15544	5.08	3.03	1	55
num_married_members	15544	3.27	1.95	1	31
num_children	15544	1.77	1.7	0	26
num_adult_members	15544	2.237	1.319	0	20
num_adult_men	12156	1.352	0.752	1	10
num_adult_women	13622	1.346	0.704	1	10
num_old_members	15544	0.212	0.491	0	3
hh_avg_age	15544	25.58	12.82	7.33	93
avg_adult_age	15063	34.69	9.063	18	64
avg_adult_educ	15063	5.729	3.676	0	22
hh_head_married	15544	0.715	0.452	0	1
age_hh_head	15543	45.37	15.68	0	108
educ_hh_head	15544	5.88	4.67	0	22
gender_hh_head	15544	1.26	0.44	0	2
hh_death	15543	0.09	0.28	0	1
family_death	15543	0.32	0.47	0	1
density	11324	1816	7684	0	77066
hh_assets (in 10,000 2015 TSH)	15542	15870	1845000	0	230100000
dur_goods_exp (in 10,000 2015 TSH)	15544	735	5178	0	215100
total_exp (in 10,000 2015 TSH)	15544	2201	8995	0	361800
dur_exp_ratio	15364	0.165	0.24	0	1
business_income (in 10,000 2015 TSH)	15544	220	5205	0	614700
nfarm_wages_1 (in 10,000 2015 TSH)	15544	449	6986	0	715300
total_bus_physical_k (in 10,000 2015 TSH)	15544	79.39	715	0	29130
animal_portfolio (in 10,000 2015 TSH)	9240	148.2	888	0	26390
bovine_holdings (in 10,000 2015 TSH)	9240	120.6	824.8	0	21650
animal_units	9240	4.147	26.09	0	527
live_sales (in 10,000 2015 TSH)	9240	13.50	94.07	0	6156
dead_sales (in 10,000 2015 TSH)	9240	0.53	10.88	0	805.2
area	13294	3.761	9.34	0	337.5
area_planted	13294	3.1	7.746	0	337.5
farm_assets (in 10,000 2015 TSH)	15542	348.3	6039	0	333800
Marketed surplus ”LRS” (in 10,000 2015 TSH)	10534	13.55	74.07	0	3653
Marketed surplus ”SRS” (in 10,000 2015 TSH)	10534	3.08	36.03	0	1955
Total marketed perennial (in 10,000 2015 TSH)	10534	16.63	85.84	0	3653
Marketed tree surplus ”LRS” (in 10,000 2015 TSH)	10534	2.01	28.80	0	2263
Marketed tree surplus ”SRS” (in 10,000 2015 TSH)	10534	6.99	111.40	0	8728
Total marketed tree surplus (in 10,000 2015 TSH)	10534	9.00	116.00	0	8728
Total marketed surplus (T + P) (in 10,000 2015 TSH)	10534	25.63	147.30	0	8728

Table 4: Plot-level Preparatory Labor Demand

VARIABLES	(1) prep_labor	(2) prep_labor	(3) n_prep_labor	(4) n_prep_labor	(5) hired_prep_labor	(6) hired_prep_labor
area_planted	0.358***	0.284***	0.357***	0.244***	0.179***	0.129***
	(0.0134)	(0.0253)	(0.0298)	(0.0605)	(0.0124)	(0.0225)
plot_expense	0.000616	0.0229***	0.0195***	0.0361***	0.118***	0.115***
	(0.00179)	(0.00338)	(0.00366)	(0.00762)	(0.00159)	(0.00365)
collective_plot	0.518***	0.512***			-0.0968**	-0.189**
	(0.0493)	(0.103)			(0.0423)	(0.0871)
rented_in	0.0259	0.153**	0.322***	-0.0256	-0.398***	-0.424***
	(0.0363)	(0.0619)	(0.0818)	(0.173)	(0.0432)	(0.0777)
irrigated	0.277***	-0.00445	0.299***	0.257	0.0201	-0.100
	(0.0553)	(0.0980)	(0.109)	(0.197)	(0.0574)	(0.122)
soil_type	0.0462***	0.107***	0.0199	0.157***	-0.00991	-0.0298
	(0.0115)	(0.0205)	(0.0225)	(0.0471)	(0.00998)	(0.0193)
soil_quality	-0.0111	0.00790	0.0137	0.0930	0.000118	-0.0112
	(0.0133)	(0.0242)	(0.0271)	(0.0652)	(0.0114)	(0.0212)
organic_fert	0.0163***	0.0482***	0.130***	0.190***	-0.0216***	-0.0321***
	(0.00390)	(0.00635)	(0.0104)	(0.0195)	(0.00446)	(0.00711)
plot_slope	-0.00209	-0.00259	-0.00163	-0.000863	-0.0139**	0.0126
	(0.00786)	(0.0144)	(0.0160)	(0.0340)	(0.00682)	(0.0136)
intercropped	0.0318**	-0.0144	0.00995	-0.0980	0.0815***	0.0592**
	(0.0156)	(0.0256)	(0.0317)	(0.0606)	(0.0134)	(0.0235)
seed_type	0.197***	0.0447	0.0572**	0.130	-0.114***	-0.314***
	(0.0142)	(0.0280)	(0.0249)	(0.0792)	(0.0125)	(0.0322)
dist_to_hh	0.00692***	0.0213***	-0.0204***	0.000258	0.0201***	0.0172***
	(0.00202)	(0.00378)	(0.00401)	(0.00826)	(0.00190)	(0.00349)
area_planted_op	-0.0415***	-0.0261	0.0316	-0.0740	0.0150	-0.0351
	(0.0129)	(0.0289)	(0.0263)	(0.0816)	(0.0118)	(0.0245)
plot_value	0.00954*	0.0725***	-0.0711***	0.0230	0.0361***	0.0250**
	(0.00576)	(0.0121)	(0.0116)	(0.0278)	(0.00475)	(0.0106)
value_all_other_plots	-0.0103***	-0.00781*	-0.00236	0.0223*	0.00195	0.00415
	(0.00166)	(0.00463)	(0.00333)	(0.0122)	(0.00161)	(0.00479)
Observations	21,281	10,417	21,281	10,417	21,281	10,417
R-squared	0.537	0.490	0.493	0.380	0.376	0.322
Number of y2_hhid		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Plot-level Preparatory Labor Demand

VARIABLES	(1) prep_labor	(2) prep_labor	(3) n_prep_labor	(4) n_prep_labor	(5) hired_prep_labor	(6) hired_prep_labor
all_female	-0.233***	-0.187**	-0.318***	-0.384*	0.0977***	0.0534
	(0.0390)	(0.0948)	(0.0756)	(0.222)	(0.0312)	(0.0725)
mixed_gend_mgr	-0.254***	-0.283***	0.652***	0.603***	0.0427	0.180*
	(0.0511)	(0.107)	(0.0401)	(0.112)	(0.0446)	(0.0924)
educ_mgr	-0.0165	0.0130	0.0543*	0.131	0.0348***	0.0750***
	(0.0143)	(0.0354)	(0.0294)	(0.0915)	(0.0119)	(0.0283)
age_mgr	1.070***	1.072***	1.216***	1.209***	0.0309*	-0.0485
	(0.0220)	(0.0523)	(0.0424)	(0.133)	(0.0161)	(0.0376)
bmi_mgr	0.0103	-0.00721	0.0853***	-0.0206	-0.00771	0.00625
	(0.00899)	(0.0315)	(0.0157)	(0.0869)	(0.00822)	(0.0263)
mgr_is_head	-0.245***	-0.393***	-0.0423	-0.0821	0.0412	0.0945
	(0.0506)	(0.109)	(0.0969)	(0.258)	(0.0390)	(0.0812)
num_children	0.0456***	-0.00443	0.131***	-0.0925	-0.0212***	0.0491**
	(0.00452)	(0.0192)	(0.0120)	(0.0665)	(0.00416)	(0.0208)
num_adult_members	0.0719***	0.0859***	0.523***	0.663***	-0.0534***	-0.0630***
	(0.00714)	(0.0231)	(0.0192)	(0.101)	(0.00621)	(0.0238)
num_old_members	-0.0587***	0.0235	0.0716*	0.299	0.00249	0.0312
	(0.0178)	(0.0725)	(0.0402)	(0.229)	(0.0156)	(0.0664)
density	-0.0505***	0.0177	-0.0420***	0.0636*	0.0198***	-0.0101
	(0.00667)	(0.0140)	(0.0124)	(0.0381)	(0.00539)	(0.0119)
hh_assets	-0.0704***	-0.0333**	-0.0962***	-0.0558	0.0517***	0.000753
	(0.00587)	(0.0135)	(0.0113)	(0.0389)	(0.00489)	(0.0120)
farm_assets	0.00177	0.000795	0.0418***	0.0361***	0.000467	0.00597
	(0.00181)	(0.00401)	(0.00376)	(0.0114)	(0.00161)	(0.00376)
animal_units	-0.0151	0.0848***	0.114***	0.0981	0.0589***	-0.0682**
	(0.00943)	(0.0319)	(0.0219)	(0.103)	(0.00959)	(0.0340)
age_hh_head	-0.522***	-0.666***	-0.0749	0.187	-0.0123	0.167
	(0.0375)	(0.137)	(0.0710)	(0.428)	(0.0303)	(0.151)
educ_hh_head	-0.0543***	0.0207	-0.0684**	-0.0347	-0.0119	-0.0560
	(0.0132)	(0.0464)	(0.0278)	(0.125)	(0.0109)	(0.0394)
gender_hh_head	-0.155***	-0.291**	-0.389***	-0.832**	0.0382	0.0119
	(0.0323)	(0.119)	(0.0662)	(0.327)	(0.0244)	(0.120)
hh_death	-0.00729	-0.0589	0.0425	-0.152	0.0325	0.0635
	(0.0261)	(0.0736)	(0.0537)	(0.183)	(0.0226)	(0.0664)
ag_wage	0.0109	-0.0249	0.00523	0.000780	-0.0254***	-0.0169
	(0.00877)	(0.0210)	(0.0160)	(0.0606)	(0.00770)	(0.0211)
Constant	1.684***	1.648*	-2.509***	-2.850	-1.299***	-0.230
	(0.231)	(0.893)	(0.433)	(2.751)	(0.206)	(0.817)
Observations	21,281	10,417	21,281	10,417	21,281	10,417
R-squared	0.537	0.490	0.493	0.380	0.376	0.322
Number of y2_hhid		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Plot-level Harvest Labor Demand

VARIABLES	(1) harv_labor	(2) harv_labor	(3) n_harv_labor	(4) n_harv_labor	(5) hired_harv_labor	(6) hired_harv_labor
area_planted	0.308***	0.212***	0.118***	0.134***	0.123***	0.0794***
	(0.0149)	(0.0263)	(0.0160)	(0.0228)	(0.00996)	(0.0181)
plot_expense	0.01000***	0.0264***	0.00739***	0.0121***	0.0551***	0.0516***
	(0.00192)	(0.00351)	(0.00204)	(0.00322)	(0.00129)	(0.00279)
collective_plot	0.369***	0.377***			-0.0515	0.0137
	(0.0552)	(0.104)			(0.0314)	(0.0728)
rented_in	-0.0550	0.0609	0.105**	0.0590	-0.140***	-0.112
	(0.0436)	(0.0721)	(0.0462)	(0.0687)	(0.0342)	(0.0704)
irrigated	0.163***	-0.211**	0.180***	0.185*	-0.125***	-0.0729
	(0.0587)	(0.106)	(0.0641)	(0.0961)	(0.0478)	(0.0862)
soil_type	0.0355***	0.0600***	0.00452	0.0381*	0.0407***	0.0372**
	(0.0126)	(0.0223)	(0.0130)	(0.0199)	(0.00793)	(0.0157)
soil_quality	0.00699	0.00349	0.0468***	0.0576**	-0.0356***	-0.0151
	(0.0144)	(0.0274)	(0.0151)	(0.0263)	(0.00886)	(0.0162)
organic_fert	0.00387	0.0216***	0.0309***	0.0267***	-0.0129***	-0.0165**
	(0.00455)	(0.00765)	(0.00542)	(0.00753)	(0.00354)	(0.00643)
plot_slope	-0.0264***	-0.0153	-0.0108	-0.0444***	-0.0170***	0.00469
	(0.00853)	(0.0163)	(0.00912)	(0.0140)	(0.00532)	(0.0110)
intercropped	0.0711***	-0.00646	0.0292	-0.0276	0.0956***	0.0437**
	(0.0170)	(0.0283)	(0.0178)	(0.0260)	(0.0106)	(0.0195)
seed_type	0.0675***	-0.0365	0.194***	0.0751**	-0.0164*	-0.157***
	(0.0156)	(0.0320)	(0.0155)	(0.0301)	(0.00988)	(0.0281)
dist_to_hh	-0.00142	0.0108***	-0.0124***	-0.0111***	0.0122***	0.00631**
	(0.00216)	(0.00380)	(0.00217)	(0.00322)	(0.00152)	(0.00274)
area_planted_op	0.0204	-0.0972***	0.136***	0.0710**	-0.00162	-0.0731***
	(0.0139)	(0.0294)	(0.0155)	(0.0315)	(0.00956)	(0.0204)
plot_value	0.0237***	0.0948***	-0.0273***	-0.00656	0.0222***	0.0339***
	(0.00600)	(0.0132)	(0.00616)	(0.00978)	(0.00354)	(0.00780)
value_all_other_plots	-0.00461**	0.00379	1.19e-05	0.00524*	0.00168	0.00137
	(0.00183)	(0.00538)	(0.00182)	(0.00318)	(0.00125)	(0.00378)
Observations	21,281	10,417	21,281	10,417	21,281	10,417
R-squared	0.352	0.284	0.428		0.219	0.164
Number of y2_hhid		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Plot-level Harvest Labor Demand

VARIABLES	(1) harv_labor	(2) harv_labor	(3) n_harv_labor	(4) n_harv_labor	(5) hired_harv_labor	(6) hired_harv_labor
all_female	-0.170***	-0.176*	-0.182***	-0.148*	0.0420*	0.00121
	(0.0407)	(0.0973)	(0.0450)	(0.0836)	(0.0243)	(0.0515)
mixed_gend_mgr	-0.220***	-0.300***	0.279***	0.265***	0.0229	-0.0496
	(0.0575)	(0.110)	(0.0228)	(0.0427)	(0.0329)	(0.0758)
educ_mgr	0.0294**	0.0520	0.0344**	0.0635**	0.0257***	0.0151
	(0.0146)	(0.0391)	(0.0159)	(0.0314)	(0.00981)	(0.0222)
age_mgr	0.722***	0.646***	0.635***	0.527***	0.0479***	0.0681**
	(0.0214)	(0.0530)	(0.0241)	(0.0454)	(0.0131)	(0.0295)
bmi_mgr	-0.00177	0.0177	0.0287***	0.0430	-0.00801	-0.0283
	(0.00999)	(0.0353)	(0.0106)	(0.0334)	(0.00657)	(0.0232)
mgr_is_head	-0.126**	-0.114	0.0256	0.172*	-0.0623**	-0.0389
	(0.0502)	(0.103)	(0.0568)	(0.0935)	(0.0312)	(0.0672)
num_children	0.0544***	-0.00258	0.0907***	0.0817***	-0.0193***	-0.00447
	(0.00503)	(0.0222)	(0.00662)	(0.0155)	(0.00334)	(0.0182)
num_adult_members	0.0667***	0.0940***	0.278***	0.283***	-0.0362***	-0.00620
	(0.00766)	(0.0299)	(0.0111)	(0.0266)	(0.00496)	(0.0188)
num_old_members	-0.0600***	-0.0168	0.0126	0.0125	-0.00740	0.00406
	(0.0194)	(0.0805)	(0.0234)	(0.0539)	(0.0122)	(0.0548)
density	-0.0415***	0.0329**	0.00222	0.000689	0.00449	0.000278
	(0.00748)	(0.0148)	(0.00758)	(0.0134)	(0.00397)	(0.00916)
hh_assets	-0.0510***	-0.0311**	-0.0486***	-0.0469***	0.0279***	0.0107
	(0.00601)	(0.0149)	(0.00623)	(0.0132)	(0.00381)	(0.00902)
farm_assets	0.00717***	0.00736	0.0224***	0.0251***	-0.00112	-0.00451
	(0.00193)	(0.00450)	(0.00199)	(0.00411)	(0.00126)	(0.00293)
animal_units	0.0186*	0.0719**	0.121***	0.0854***	0.0527***	-0.0274
	(0.0104)	(0.0348)	(0.0126)	(0.0278)	(0.00796)	(0.0291)
age_hh_head	-0.333***	-0.137	0.0504	0.125	-0.0790***	-0.000600
	(0.0388)	(0.156)	(0.0398)	(0.0849)	(0.0241)	(0.112)
educ_hh_head	-0.0523***	-0.0611	-0.0420***	-0.0610*	-0.0289***	0.0236
	(0.0132)	(0.0446)	(0.0146)	(0.0322)	(0.00936)	(0.0341)
gender_hh_head	-0.0533	-0.0837	-0.159***	-0.162**	0.0184	0.0414
	(0.0337)	(0.127)	(0.0373)	(0.0738)	(0.0191)	(0.0888)
hh_death	0.0479*	-0.0384	0.0407	-0.0599	0.0170	0.0382
	(0.0281)	(0.0709)	(0.0314)	(0.0623)	(0.0178)	(0.0515)
ag_wage	-0.0144	-0.0229	-0.0119	-0.0263	0.00526	0.000371
	(0.0101)	(0.0237)	(0.00983)	(0.0220)	(0.00559)	(0.0158)
Constant	0.635**	0.380	-1.326***	-2.474***	-0.570***	-0.606
	(0.250)	(0.791)	(0.254)	(0.648)	(0.164)	(0.585)
Observations	21,281	10,417	21,281	10,417	21,281	10,417
R-squared	0.352	0.284	0.428		0.219	0.164
Number of y2_hhid		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Fertilizer Factor Allocation Regressions

VARIABLES	(1) org_fert_acre	(2) org_fert_acre	(3) org_fert_acre	(4) org_fert_acre	(5) org_fert_acre	(6) org_fert_acre
num_children	-0.0453***	-0.0592***	-0.0240***	-0.0423***	-0.0240***	-0.0240**
	(0.00753)	(0.0136)	(0.00741)	(0.0132)	(0.00741)	(0.0121)
num_adult_members	-0.0149	-0.00611	0.00768	0.0113	0.00768	0.00768
	(0.0114)	(0.0183)	(0.0113)	(0.0182)	(0.0113)	(0.0129)
num_old_members	-0.000292	-0.00128	0.0191	0.0129	0.0191	0.0191
	(0.0273)	(0.0509)	(0.0274)	(0.0510)	(0.0274)	(0.0277)
plot_expense	0.0186***	0.0112**	0.0193***	0.0117***	0.0193***	0.0193***
	(0.00265)	(0.00439)	(0.00267)	(0.00441)	(0.00267)	(0.00325)
collective_plot	-0.0309	-2.75e-05	-0.0399	-0.0188	-0.0399	-0.0399
	(0.0718)	(0.0997)	(0.0730)	(0.102)	(0.0730)	(0.0760)
rented_in	-0.301***	-0.398***	-0.298***	-0.408***	-0.298***	-0.298***
	(0.0529)	(0.0952)	(0.0533)	(0.0957)	(0.0533)	(0.0668)
irrigated	-1.053***	-0.967***	-1.078***	-0.997***	-1.078***	-1.078***
	(0.148)	(0.261)	(0.148)	(0.259)	(0.148)	(0.246)
density	0.0603***	0.0218*	0.0642***	0.0209	0.0642***	0.0642***
	(0.00987)	(0.0131)	(0.00994)	(0.0133)	(0.00994)	(0.0146)
soil_quality	0.0532***	0.0321	0.0546***	0.0305	0.0546***	0.0546**
	(0.0206)	(0.0319)	(0.0208)	(0.0321)	(0.0208)	(0.0228)
plot_slope	0.0803***	0.0355*	0.0689***	0.0285	0.0689***	0.0689***
	(0.0124)	(0.0203)	(0.0125)	(0.0205)	(0.0125)	(0.0187)
intercropped	-0.169***	-0.147***	-0.137***	-0.125***	-0.137***	-0.137***
	(0.0236)	(0.0355)	(0.0237)	(0.0354)	(0.0237)	(0.0292)
seed_type	0.105***	0.0988*	0.117***	0.0958*	0.117***	0.117***
	(0.0236)	(0.0570)	(0.0237)	(0.0572)	(0.0237)	(0.0211)
dist_to_hh	-0.0562***	-0.0637***	-0.0579***	-0.0650***	-0.0579***	-0.0579***
	(0.00244)	(0.00453)	(0.00246)	(0.00457)	(0.00246)	(0.00338)
area_planted_op	-0.176***	-0.0755***	-0.148***	-0.0631**	-0.148***	-0.148***
	(0.0175)	(0.0258)	(0.0175)	(0.0264)	(0.0175)	(0.0214)
plot_value	0.0752***	0.0725***	0.0839***	0.0764***	0.0839***	0.0839***
	(0.00856)	(0.0135)	(0.00865)	(0.0136)	(0.00865)	(0.0113)
hh_assets	0.0505***	0.0469***	0.0529***	0.0500***	0.0529***	0.0529***
	(0.00866)	(0.0166)	(0.00870)	(0.0167)	(0.00870)	(0.0109)
farm_assets	0.0168***	0.0223***	0.0188***	0.0226***	0.0188***	0.0188***
	(0.00253)	(0.00424)	(0.00298)	(0.00483)	(0.00298)	(0.00406)
animal_units	0.293***	0.271***				
	(0.0181)	(0.0358)				
animal_portfolio			0.0273***	0.0236***	0.0273***	0.0273***
			(0.00247)	(0.00419)	(0.00247)	(0.00268)
Observations	21,138	10,388	21,138	10,388	21,138	21,138
R-squared	0.146		0.134		0.134	
Number of y2_hhid		2,727		2,727		
Number of ea						185

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Plot-level Fertilizer Factor Allocation

VARIABLES	(1) org_fert_acre	(2) org_fert_acre	(3) org_fert_acre	(4) org_fert_acre	(5) org_fert_acre	(6) org_fert_acre
age_hh_head	-0.0450	-0.102	-0.0221	-0.0818	-0.0221	-0.0221
	(0.0521)	(0.0958)	(0.0523)	(0.0959)	(0.0523)	(0.0741)
educ_hh_head	0.0452**	0.0115	0.0391**	0.0115	0.0391**	0.0391*
	(0.0192)	(0.0359)	(0.0193)	(0.0363)	(0.0193)	(0.0212)
gender_hh_head	-0.0177	-0.0285	0.00645	-0.00863	0.00645	0.00645
	(0.0412)	(0.0741)	(0.0414)	(0.0751)	(0.0414)	(0.0707)
hh_death	-0.0133	0.0217	-0.0241	0.0167	-0.0241	-0.0241
	(0.0386)	(0.0583)	(0.0390)	(0.0593)	(0.0390)	(0.0502)
mgr_is_head	0.0970	0.0466	0.115*	0.0449	0.115*	0.115
	(0.0611)	(0.0994)	(0.0616)	(0.0997)	(0.0616)	(0.0777)
all_female	0.122**	0.106	0.0816	0.0768	0.0816	0.0816
	(0.0507)	(0.0878)	(0.0509)	(0.0882)	(0.0509)	(0.0696)
mixed_gend_mgr	0.120	0.117	0.0983	0.119	0.0983	0.0983
	(0.0765)	(0.106)	(0.0777)	(0.108)	(0.0777)	(0.0902)
educ_mgr	0.0209	0.0389	0.00341	0.0260	0.00341	0.00341
	(0.0262)	(0.0423)	(0.0264)	(0.0425)	(0.0264)	(0.0254)
age_mgr	0.0249	0.0356	0.0278	0.0399	0.0278	0.0278
	(0.0307)	(0.0515)	(0.0309)	(0.0514)	(0.0309)	(0.0327)
bmi_mgr	-0.0147	-0.0568	-0.0110	-0.0487	-0.0110	-0.0110
	(0.0162)	(0.0432)	(0.0163)	(0.0431)	(0.0163)	(0.0127)
plot_prep_avg_age	0.00490	0.00553	0.00341	0.00237	0.00341	0.00341
	(0.0175)	(0.0387)	(0.0176)	(0.0390)	(0.0176)	(0.0206)
plot_prep_avg_bmi	0.0131	0.0684	0.0126	0.0709	0.0126	0.0126
	(0.00974)	(0.0432)	(0.00987)	(0.0441)	(0.00987)	(0.00808)
plot_prep_avg_educ	0.0607***	0.0745**	0.0650***	0.0751**	0.0650***	0.0650***
	(0.0175)	(0.0303)	(0.0176)	(0.0306)	(0.0176)	(0.0205)
Constant	0.312	2.195	-0.168		-0.168	-0.168
	(0.391)	(1.976)	(0.390)		(0.390)	(0.496)
Observations	21,138	10,388	21,138	10,388	21,138	21,138
R-squared	0.146		0.134		0.134	
Number of y2_hhid		2,727		2,727		
Number of ea						185

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Market Surplus Regressions

VARIABLES	(1) pr_mkt_surp	(2) mkt_surp	(3) mkt_surp	(4) tree_surp	(5) tree_surp	(6) mkt_surp	(7) tree_surp
hh_head_married	0.0995**	0.219*	0.204	0.0896	0.101	0.219*	0.0896
	(0.0478)	(0.113)	(0.169)	(0.0824)	(0.0916)	(0.117)	(0.0590)
num_children	-0.0161	-0.0408	-0.000120	-0.0247	-0.0141	-0.0408	-0.0247
	(0.0133)	(0.0333)	(0.0522)	(0.0242)	(0.0276)	(0.0282)	(0.0221)
num_adult_members	-0.0727***	-0.170***	-0.115**	-0.106***	-0.0869***	-0.170***	-0.106***
	(0.0134)	(0.0301)	(0.0473)	(0.0231)	(0.0252)	(0.0311)	(0.0264)
num_old_members	-0.0360	-0.100	0.0634	-0.179**	-0.0838	-0.100	-0.179**
	(0.0374)	(0.0964)	(0.157)	(0.0764)	(0.0874)	(0.0917)	(0.0760)
density	-0.0239***	-0.0904***	-0.126***	-0.0122	-0.0150	-0.0904**	-0.0122
	(0.00767)	(0.0238)	(0.0280)	(0.0196)	(0.0213)	(0.0357)	(0.0275)
hh_death	0.0301	0.0431	0.00805	-0.0341	-0.0421	0.0431	-0.0341
	(0.0490)	(0.129)	(0.157)	(0.0995)	(0.109)	(0.151)	(0.104)
hh_avg_age	-0.00718	0.00453	-0.242	0.391***	0.274*	0.00453	0.391**
	(0.0737)	(0.184)	(0.284)	(0.142)	(0.165)	(0.167)	(0.154)
age_hh_head	0.0597	0.0240	0.190	0.577***	0.502***	0.0240	0.577***
	(0.0710)	(0.168)	(0.237)	(0.127)	(0.147)	(0.191)	(0.131)
educ_hh_head	-0.0128	-0.0192	0.0123	0.0769***	0.0445	-0.0192	0.0769**
	(0.0160)	(0.0395)	(0.0635)	(0.0297)	(0.0359)	(0.0428)	(0.0319)
gender_hh_head	-0.332***	-0.937***	-0.701	-0.471**	-0.631***	-0.937***	-0.471***
	(0.119)	(0.284)	(0.460)	(0.208)	(0.244)	(0.264)	(0.170)
animal_portfolio	0.0122***	0.0566***	0.0255**	0.0165**	0.0192**	0.0566***	0.0165*
	(0.00298)	(0.00921)	(0.0118)	(0.00709)	(0.00793)	(0.0115)	(0.00940)
farm_assets	0.0714***	0.119***	0.0297***	0.0441***	0.0334***	0.119***	0.0441***
	(0.00376)	(0.00823)	(0.0105)	(0.00603)	(0.00607)	(0.0145)	(0.00893)
hh_assets	-0.0288***	-0.0391**	0.0807***	0.0195	-0.00150	-0.0391	0.0195
	(0.00977)	(0.0183)	(0.0287)	(0.0130)	(0.0122)	(0.0296)	(0.0136)
Constant	-0.312	5.276***	4.235***	-1.483***	-0.287	3.819***	-1.483**
	(0.273)	(0.654)	(0.927)	(0.484)	(0.541)	(0.720)	(0.609)
Observations	9,313	15,535	12,005	15,535	12,005	15,535	15,535
R-squared		0.277	0.356	0.136		0.210	
Number of ea						282	282
Number of y2_hhid			3,923		3,923		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Labor Days - Model Estimates

	# of of plots under-reporting	# of of plots over-reporting
Child prep labor	15,550	1,289
Adult prep labor	81	4,744
Senior prep labor	3,250	17,278
Child harvest labor	15,260	1,579
Adult harvest labor	81	4,744
Senior harvest labor	4,033	16,519

Table 9: Robustness 1 - Interview Dummies

VARIABLES	(1) prep_labor	(2) prep_labor	(3) hired_prep_labor	(4) hired_prep_labor	(5) harv_labor	(6) harv_labor	(7) hired_harv_labor	(8) hired_harv_labor
area_planted	0.339***	0.283***	0.177***	0.131***	0.309***	0.213***	0.120***	0.0806***
	(0.0144)	(0.0252)	(0.0133)	(0.0226)	(0.0158)	(0.0262)	(0.0108)	(0.0181)
plot_expense	0.00302	0.0223***	0.117***	0.115***	0.00984***	0.0266***	0.0581***	0.0513***
	(0.00200)	(0.00337)	(0.00179)	(0.00366)	(0.00211)	(0.00350)	(0.00146)	(0.00278)
collective_plot	0.479***	0.504***	-0.101**	-0.198**	0.396***	0.382***	-0.0338	0.00495
	(0.0570)	(0.103)	(0.0482)	(0.0874)	(0.0574)	(0.103)	(0.0375)	(0.0714)
rented_in	0.101**	0.154**	-0.447***	-0.419***	0.0453	0.0664	-0.159***	-0.108
	(0.0419)	(0.0615)	(0.0504)	(0.0784)	(0.0487)	(0.0717)	(0.0413)	(0.0705)
irrigated	0.213***	-0.000829	0.0780	-0.105	0.136**	-0.216**	-0.0869	-0.0696
	(0.0643)	(0.0972)	(0.0654)	(0.122)	(0.0668)	(0.107)	(0.0540)	(0.0862)
soil_type	0.0643***	0.106***	-0.0126	-0.0330*	0.0380***	0.0581***	0.0492***	0.0361**
	(0.0131)	(0.0205)	(0.0112)	(0.0192)	(0.0136)	(0.0224)	(0.00922)	(0.0157)
soil_quality	-0.00884	0.00712	0.00337	-0.0102	-0.0256	0.00167	-0.0376***	-0.0138
	(0.0149)	(0.0240)	(0.0127)	(0.0212)	(0.0157)	(0.0271)	(0.0101)	(0.0162)
organic_fert	0.0246***	0.0473***	-0.0258***	-0.0323***	0.00666	0.0218***	-0.0166***	-0.0167***
	(0.00422)	(0.00633)	(0.00487)	(0.00705)	(0.00501)	(0.00761)	(0.00391)	(0.00649)
plot_slope	-0.00738	-0.00125	-0.00821	0.0131	-0.0359***	-0.0166	-0.0130**	0.00509
	(0.00893)	(0.0144)	(0.00759)	(0.0136)	(0.00940)	(0.0162)	(0.00609)	(0.0111)
intercropped	0.0110	-0.0130	0.0750***	0.0622***	0.00324	-0.00962	0.0876***	0.0444**
	(0.0174)	(0.0256)	(0.0147)	(0.0236)	(0.0181)	(0.0282)	(0.0120)	(0.0195)
seed_type	0.206***	0.0627**	-0.104***	-0.303***	0.116***	-0.0330	-0.0267**	-0.144***
	(0.0152)	(0.0272)	(0.0137)	(0.0329)	(0.0163)	(0.0323)	(0.0109)	(0.0280)
dist_to_hh	0.00871***	0.0214***	0.0209***	0.0173***	-6.66e-06	0.0108***	0.0125***	0.00645**
	(0.00223)	(0.00373)	(0.00207)	(0.00349)	(0.00225)	(0.00378)	(0.00169)	(0.00274)
area_planted_op	-0.0272*	-0.0362	0.0235*	-0.0335	0.0206	-0.0988***	0.00289	-0.0701***
	(0.0144)	(0.0291)	(0.0130)	(0.0246)	(0.0151)	(0.0297)	(0.0109)	(0.0204)
plot_value	0.0129**	0.0721***	0.0338***	0.0253**	0.0258***	0.0936***	0.0208***	0.0342***
	(0.00643)	(0.0121)	(0.00520)	(0.0106)	(0.00641)	(0.0132)	(0.00392)	(0.00787)
value_all_other_plots	-0.0126***	-0.00703	0.00235	0.00354	-0.00689***	0.00439	0.00212	0.000890
	(0.00182)	(0.00461)	(0.00176)	(0.00479)	(0.00196)	(0.00537)	(0.00137)	(0.00379)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.574	0.493	0.388	0.323	0.399	0.288	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Robustness 1 ctd. - Interview Dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	prep_labor	prep_labor	hired_prep_labor	hired_prep_labor	harv_labor	harv_labor	hired_harv_labor	hired_harv_labor
all_female	-0.214***	-0.188**	0.0752**	0.0579	-0.148***	-0.182*	0.0493*	0.00579
	(0.0428)	(0.0945)	(0.0348)	(0.0727)	(0.0434)	(0.0970)	(0.0272)	(0.0514)
mixed_gend_mgr	-0.188***	-0.278***	0.0170	0.188**	-0.231***	-0.310***	-0.00631	-0.0417
	(0.0593)	(0.107)	(0.0508)	(0.0926)	(0.0603)	(0.109)	(0.0395)	(0.0745)
educ_mgr	-0.0156	0.0134	0.0422***	0.0788***	0.0232	0.0500	0.0290***	0.0159
	(0.0156)	(0.0353)	(0.0130)	(0.0282)	(0.0155)	(0.0392)	(0.0110)	(0.0220)
age_mgr	1.082***	1.073***	0.0384**	-0.0534	0.720***	0.650***	0.0448***	0.0655**
	(0.0240)	(0.0523)	(0.0175)	(0.0375)	(0.0224)	(0.0529)	(0.0143)	(0.0293)
bmi_mgr	0.0105	-0.0123	-0.00797	0.00556	0.00425	0.0209	-0.0112	-0.0280
	(0.00911)	(0.0315)	(0.00858)	(0.0262)	(0.0102)	(0.0352)	(0.00695)	(0.0234)
mgr_is_head	-0.268***	-0.392***	0.0299	0.103	-0.136**	-0.121	-0.0541	-0.0377
	(0.0566)	(0.109)	(0.0440)	(0.0820)	(0.0541)	(0.103)	(0.0349)	(0.0672)
num_children	0.0488***	-0.00547	-0.0148***	0.0483**	0.0521***	0.000424	-0.0161***	-0.00457
	(0.00502)	(0.0192)	(0.00461)	(0.0209)	(0.00538)	(0.0222)	(0.00376)	(0.0182)
num_adult_members	0.0713***	0.0857***	-0.0565***	-0.0583**	0.0683***	0.0933***	-0.0399***	-0.00422
	(0.00794)	(0.0234)	(0.00679)	(0.0239)	(0.00817)	(0.0296)	(0.00557)	(0.0189)
num_old_members	-0.0691***	0.0273	-0.0109	0.0361	-0.0778***	-0.0155	-0.0181	0.00826
	(0.0200)	(0.0728)	(0.0170)	(0.0660)	(0.0210)	(0.0794)	(0.0136)	(0.0552)
density	-0.0297***	0.0210	0.0123*	-0.00920	-0.0276***	0.0372**	0.00208	0.000571
	(0.00954)	(0.0140)	(0.00710)	(0.0121)	(0.00930)	(0.0150)	(0.00554)	(0.00933)
hh_assets	-0.0756***	-0.0292**	0.0551***	-0.000271	-0.0506***	-0.0278*	0.0292***	0.00892
	(0.00632)	(0.0135)	(0.00521)	(0.0120)	(0.00647)	(0.0150)	(0.00411)	(0.00914)
farm_assets	0.00137	0.000587	0.000694	0.00596	0.00782***	0.00733	-0.00125	-0.00428
	(0.00190)	(0.00395)	(0.00167)	(0.00374)	(0.00198)	(0.00446)	(0.00132)	(0.00294)
animal_units	-0.0145	0.0846***	0.0446***	-0.0674**	0.00331	0.0718**	0.0471***	-0.0284
	(0.0103)	(0.0321)	(0.0104)	(0.0337)	(0.0111)	(0.0351)	(0.00886)	(0.0290)
age_hh_head	-0.491***	-0.658***	0.00331	0.155	-0.275***	-0.145	-0.0367	-0.0108
	(0.0414)	(0.135)	(0.0328)	(0.152)	(0.0411)	(0.155)	(0.0268)	(0.112)
educ_hh_head	-0.0524***	0.0194	-0.0189	-0.0575	-0.0532***	-0.0610	-0.0313***	0.0252
	(0.0140)	(0.0466)	(0.0116)	(0.0390)	(0.0137)	(0.0446)	(0.0103)	(0.0337)
gender_hh_head	-0.163***	-0.281**	0.0201	0.0172	-0.0466	-0.0912	0.0314	0.0471
	(0.0340)	(0.119)	(0.0260)	(0.121)	(0.0348)	(0.127)	(0.0201)	(0.0885)
hh_death	-0.0382	-0.0612	0.0365	0.0599	0.0356	-0.0521	0.0314	0.0340
	(0.0307)	(0.0721)	(0.0265)	(0.0660)	(0.0322)	(0.0705)	(0.0217)	(0.0519)
ag_wage	0.0198*	-0.0254	-0.0306***	-0.0137	-0.0105	-0.0281	0.00172	0.00192
	(0.0117)	(0.0216)	(0.0101)	(0.0213)	(0.0126)	(0.0242)	(0.00785)	(0.0161)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.574	0.493	0.388	0.323	0.399	0.288	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Robustness 1 ctd. - Interview Dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	prep_labor	prep_labor	hired_prep_labor	hired_prep_labor	harv_labor	harv_labor	hired_harv_labor	hired_harv_labor
2.interview_month	-0.0241	0.0744	0.0640*	0.0608	0.0899**	0.194**	0.0634**	0.0799
	(0.0401)	(0.0845)	(0.0344)	(0.0933)	(0.0420)	(0.0979)	(0.0277)	(0.0674)
3.interview_month	0.117***	0.0773	0.0506	0.161	0.0918**	0.156	0.0641**	0.100
	(0.0421)	(0.0981)	(0.0373)	(0.104)	(0.0446)	(0.114)	(0.0300)	(0.0768)
4.interview_month	0.00953	0.0215	0.0170	0.0263	0.0867**	0.0453	0.0463	0.0430
	(0.0403)	(0.132)	(0.0363)	(0.128)	(0.0428)	(0.138)	(0.0292)	(0.0941)
5.interview_month	0.0825**	0.0285	-0.0295	-0.163	0.106***	-0.0445	0.0405	-0.0785
	(0.0384)	(0.135)	(0.0333)	(0.133)	(0.0405)	(0.148)	(0.0259)	(0.105)
6.interview_month	0.137***	0.142	0.0347	-0.132	0.183***	0.0445	0.0154	-0.0538
	(0.0414)	(0.142)	(0.0347)	(0.138)	(0.0429)	(0.153)	(0.0274)	(0.110)
7.interview_month	0.0333	-0.149	-0.0471	-0.164	0.139***	-0.0213	0.0207	-0.0542
	(0.0379)	(0.151)	(0.0341)	(0.144)	(0.0402)	(0.158)	(0.0269)	(0.123)
8.interview_month	0.189***	-0.0249	-0.0120	-0.0398	0.177***	0.427**	0.0538*	-0.107
	(0.0384)	(0.158)	(0.0348)	(0.154)	(0.0411)	(0.166)	(0.0290)	(0.139)
9.interview_month	0.166***	-0.250	-0.0414	-0.0309	0.127**	0.261	0.0570	-0.0768
	(0.0580)	(0.179)	(0.0497)	(0.193)	(0.0578)	(0.182)	(0.0402)	(0.170)
10.interview_month	0.0586	0.0522	0.00273	0.0219	0.0753*	0.211	0.00562	-0.00681
	(0.0388)	(0.131)	(0.0331)	(0.124)	(0.0406)	(0.147)	(0.0258)	(0.0895)
11.interview_month	0.0925**	0.176	0.0614*	0.00472	0.141***	0.121	0.0787***	0.0512
	(0.0385)	(0.128)	(0.0319)	(0.106)	(0.0401)	(0.128)	(0.0261)	(0.0857)
12.interview_month	0.126***	0.259**	0.0103	0.0847	0.126***	-0.0399	0.0332	0.0156
	(0.0381)	(0.101)	(0.0316)	(0.0813)	(0.0399)	(0.108)	(0.0247)	(0.0684)
Constant	0.908**	1.377	-0.829*	-0.202	0.0845	0.159	-0.812***	-0.525
	(0.409)	(0.859)	(0.497)	(0.817)	(0.863)	(0.827)	(0.240)	(0.602)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.574	0.493	0.388	0.323	0.399	0.288	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Robustness 2 - Endogenous HH Size Check

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	prep_days_r2	prep_days_r2	hired_prep_labor	hired_prep_labor	harv_days_r2	harv_days_r2	hired_harv_labor	hired_harv_labor
area_planted	0.157***	0.259***	0.175***	0.131***	0.241***	0.213***	0.120***	0.0810***
	(0.0171)	(0.0293)	(0.0133)	(0.0226)	(0.0143)	(0.0263)	(0.0108)	(0.0181)
plot_expense	0.00921***	0.0209***	0.117***	0.115***	0.0146***	0.0258***	0.0580***	0.0513***
	(0.00212)	(0.00390)	(0.00179)	(0.00366)	(0.00185)	(0.00353)	(0.00146)	(0.00278)
collective_plot	0.332***	0.528***	-0.107**	-0.198**	0.321***	0.431***	-0.0351	0.0118
	(0.0642)	(0.157)	(0.0482)	(0.0871)	(0.0526)	(0.102)	(0.0374)	(0.0713)
rented_in	0.0671	0.136	-0.453***	-0.418***	0.0842*	0.0717	-0.164***	-0.109
	(0.0506)	(0.0844)	(0.0505)	(0.0784)	(0.0466)	(0.0728)	(0.0413)	(0.0705)
irrigated	0.184***	0.122	0.0840	-0.105	0.115**	-0.210**	-0.0818	-0.0697
	(0.0697)	(0.113)	(0.0655)	(0.123)	(0.0586)	(0.107)	(0.0541)	(0.0864)
soil_type	0.0424***	0.112***	-0.0120	-0.0331*	0.0132	0.0610***	0.0498***	0.0361**
	(0.0136)	(0.0240)	(0.0112)	(0.0192)	(0.0122)	(0.0224)	(0.00921)	(0.0157)
soil_quality	-0.0162	-0.00515	0.00288	-0.0104	-0.00931	0.00139	-0.0377***	-0.0141
	(0.0157)	(0.0300)	(0.0127)	(0.0213)	(0.0139)	(0.0273)	(0.0101)	(0.0162)
organic_fert	0.0257***	0.0407***	-0.0257***	-0.0322***	0.00855*	0.0221***	-0.0166***	-0.0167***
	(0.00493)	(0.00793)	(0.00488)	(0.00707)	(0.00447)	(0.00765)	(0.00391)	(0.00647)
plot_slope	-0.0147	0.0137	-0.00694	0.0130	-0.0346***	-0.0196	-0.0121**	0.00503
	(0.00963)	(0.0174)	(0.00758)	(0.0136)	(0.00864)	(0.0164)	(0.00608)	(0.0111)
intercropped	-0.0121	-0.0202	0.0751***	0.0631***	0.0198	-0.00862	0.0881***	0.0453**
	(0.0189)	(0.0298)	(0.0147)	(0.0236)	(0.0165)	(0.0283)	(0.0120)	(0.0195)
seed_type	-0.191***	0.0424	-0.104***	-0.303***	-0.190***	-0.0268	-0.0272**	-0.143***
	(0.0132)	(0.0358)	(0.0137)	(0.0327)	(0.0113)	(0.0326)	(0.0109)	(0.0279)
dist_to_hh	0.00642***	0.0226***	0.0207***	0.0173***	0.00177	0.0113***	0.0123***	0.00646**
	(0.00246)	(0.00413)	(0.00207)	(0.00348)	(0.00209)	(0.00376)	(0.00168)	(0.00273)
area_planted_op	-0.0607***	0.00107	0.0227*	-0.0336	-0.0668***	-0.0938***	0.00259	-0.0691***
	(0.0158)	(0.0420)	(0.0130)	(0.0246)	(0.0132)	(0.0300)	(0.0109)	(0.0204)
plot_value	0.00958	0.0578***	0.0328***	0.0253**	0.0190***	0.0948***	0.0202***	0.0343***
	(0.00689)	(0.0132)	(0.00519)	(0.0105)	(0.00580)	(0.0132)	(0.00391)	(0.00787)
value_all_other_plots	-0.00443**	-0.00597	0.00277	0.00300	0.000603	0.00413	0.00251*	0.000773
	(0.00209)	(0.00594)	(0.00176)	(0.00481)	(0.00180)	(0.00536)	(0.00137)	(0.00379)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.654	0.390	0.387	0.323	0.574	0.284	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Robustness 2 - Endogenous HH Size Check

VARIABLES	(1) prep_days_r2	(2) prep_days_r2	(3) hired_prep_labor	(4) hired_prep_labor	(5) harv_days_r2	(6) harv_days_r2	(7) hired_harv_labor	(8) hired_harv_labor
all_female	-0.100**	0.0117	0.0775**	0.0576	-0.129***	-0.174*	0.0487*	0.00427
	(0.0448)	(0.109)	(0.0349)	(0.0728)	(0.0401)	(0.0972)	(0.0272)	(0.0514)
mixed_gend_mgr	-0.0791	-0.237	0.0193	0.186**	-0.227***	-0.345***	-0.00774	-0.0487
	(0.0678)	(0.164)	(0.0508)	(0.0925)	(0.0552)	(0.109)	(0.0394)	(0.0745)
educ_mgr	0.0136	0.0714	0.0434***	0.0784***	0.0217	0.0576	0.0298***	0.0159
	(0.0169)	(0.0456)	(0.0130)	(0.0282)	(0.0142)	(0.0392)	(0.0110)	(0.0220)
age_mgr	0.824***	0.945***	0.0362**	-0.0517	0.572***	0.646***	0.0442***	0.0685**
	(0.0246)	(0.0607)	(0.0175)	(0.0376)	(0.0210)	(0.0533)	(0.0143)	(0.0293)
bmi_mgr	0.101***	-0.00151	-0.00826	0.00518	0.0721***	0.0132	-0.0115*	-0.0296
	(0.0105)	(0.0394)	(0.00861)	(0.0262)	(0.00834)	(0.0352)	(0.00696)	(0.0235)
mgr_is_head	-0.310***	-0.354***	0.0404	0.0991	-0.0996**	-0.124	-0.0489	-0.0431
	(0.0539)	(0.117)	(0.0440)	(0.0821)	(0.0487)	(0.104)	(0.0347)	(0.0669)
num_children_r2	0.0234***	0.0342	-0.0170***	0.0443**	0.0404***	0.00788	-0.0170***	-0.000474
	(0.00571)	(0.0324)	(0.00454)	(0.0200)	(0.00501)	(0.0218)	(0.00370)	(0.0175)
num_adult_members_r2	0.0513***	-0.0192	-0.0493***	-0.0497**	0.0662***	0.0647***	-0.0386***	-0.0183
	(0.00804)	(0.0320)	(0.00646)	(0.0207)	(0.00714)	(0.0245)	(0.00535)	(0.0172)
num_old_members_r2	-0.0464**	-0.258***	0.00464	-0.0117	-0.0763***	-0.156**	-0.0117	-0.0439
	(0.0218)	(0.0785)	(0.0172)	(0.0535)	(0.0196)	(0.0684)	(0.0137)	(0.0469)
density	-0.0235**	0.0354*	0.0114	-0.00919	-0.0342***	0.0372**	0.00162	0.00115
	(0.0106)	(0.0184)	(0.00707)	(0.0121)	(0.00935)	(0.0151)	(0.00553)	(0.00932)
hh_assets	-0.0455***	-0.0379**	0.0533***	0.000351	-0.0408***	-0.0271*	0.0286***	0.0105
	(0.00629)	(0.0188)	(0.00518)	(0.0120)	(0.00558)	(0.0152)	(0.00408)	(0.00914)
farm_assets	-0.000403	-0.00621	0.000552	0.00584	0.00474***	0.00729	-0.00134	-0.00415
	(0.00198)	(0.00531)	(0.00167)	(0.00374)	(0.00174)	(0.00450)	(0.00132)	(0.00292)
animal_units	-0.0516***	0.144***	0.0431***	-0.0683**	-0.0214**	0.0848**	0.0465***	-0.0285
	(0.0120)	(0.0508)	(0.0104)	(0.0339)	(0.0102)	(0.0363)	(0.00885)	(0.0290)
age_hh_head	-0.482***	-0.517***	-0.0101	0.182	-0.272***	-0.0631	-0.0434*	0.0365
	(0.0426)	(0.166)	(0.0322)	(0.146)	(0.0369)	(0.153)	(0.0262)	(0.109)
educ_hh_head	-0.0244	0.0137	-0.0198*	-0.0591	-0.0305**	-0.0651	-0.0319***	0.0235
	(0.0153)	(0.0549)	(0.0116)	(0.0389)	(0.0127)	(0.0448)	(0.0102)	(0.0338)
gender_hh_head	-0.172***	-0.182	0.0154	0.0203	-0.0487	-0.0720	0.0281	0.0603
	(0.0375)	(0.167)	(0.0260)	(0.121)	(0.0336)	(0.127)	(0.0201)	(0.0878)
hh_death	0.0253	-0.0110	0.0345	0.0573	0.0245	-0.0601	0.0303	0.0288
	(0.0333)	(0.0948)	(0.0265)	(0.0655)	(0.0307)	(0.0709)	(0.0217)	(0.0519)
ag_wage	0.0192	-0.0150	-0.0302***	-0.0142	-0.0231**	-0.0278	0.00191	0.00120
	(0.0131)	(0.0317)	(0.0101)	(0.0213)	(0.0117)	(0.0244)	(0.00786)	(0.0161)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.654	0.390	0.387	0.323	0.574	0.284	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Robustness 2 - Endogenous HH Size Check

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	prep_days_r2	prep_days_r2	hired_prep_labor	hired_prep_labor	harv_days_r2	harv_days_r2	hired_harv_labor	hired_harv_labor
2.interview_month	0.0102	-0.0550	0.0630*	0.0588	0.0695*	0.182*	0.0630**	0.0797
	(0.0417)	(0.122)	(0.0345)	(0.0931)	(0.0375)	(0.0994)	(0.0276)	(0.0672)
3.interview_month	0.116**	-0.0810	0.0526	0.162	0.110***	0.128	0.0655**	0.0951
	(0.0470)	(0.144)	(0.0373)	(0.105)	(0.0415)	(0.114)	(0.0300)	(0.0769)
4.interview_month	0.0253	-0.0600	0.0147	0.0242	0.0819**	0.0253	0.0444	0.0385
	(0.0433)	(0.175)	(0.0363)	(0.128)	(0.0381)	(0.139)	(0.0293)	(0.0943)
5.interview_month	0.0372	-0.0653	-0.0306	-0.167	0.116***	-0.0689	0.0399	-0.0816
	(0.0418)	(0.179)	(0.0333)	(0.133)	(0.0362)	(0.149)	(0.0259)	(0.106)
6.interview_month	0.110**	0.257	0.0344	-0.136	0.115***	0.0423	0.0160	-0.0574
	(0.0446)	(0.189)	(0.0347)	(0.138)	(0.0384)	(0.155)	(0.0273)	(0.110)
7.interview_month	0.0265	-0.109	-0.0443	-0.167	0.112***	-0.0273	0.0224	-0.0585
	(0.0401)	(0.197)	(0.0341)	(0.143)	(0.0360)	(0.159)	(0.0269)	(0.123)
8.interview_month	0.117***	0.227	-0.0133	-0.0481	0.164***	0.425**	0.0532*	-0.114
	(0.0427)	(0.218)	(0.0348)	(0.154)	(0.0368)	(0.168)	(0.0290)	(0.140)
9.interview_month	0.224***	0.142	-0.0405	-0.0400	0.122**	0.253	0.0580	-0.0840
	(0.0655)	(0.256)	(0.0496)	(0.193)	(0.0570)	(0.184)	(0.0402)	(0.170)
10.interview_month	0.0556	0.0637	-0.000420	0.0205	0.128***	0.193	0.00399	-0.0101
	(0.0432)	(0.191)	(0.0331)	(0.123)	(0.0367)	(0.148)	(0.0258)	(0.0891)
11.interview_month	0.114***	0.0832	0.0621*	0.00420	0.138***	0.121	0.0794***	0.0472
	(0.0416)	(0.154)	(0.0319)	(0.105)	(0.0367)	(0.127)	(0.0261)	(0.0852)
12.interview_month	0.0552	0.240*	0.0124	0.0867	0.0579	-0.0387	0.0342	0.0133
	(0.0392)	(0.126)	(0.0316)	(0.0810)	(0.0354)	(0.107)	(0.0247)	(0.0682)
Constant	1.679***	-1.243	-0.795	-0.284	0.784	-0.0411	-0.800***	-0.647
	(0.361)	(1.577)	(0.485)	(0.803)	(0.789)	(0.827)	(0.245)	(0.601)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.654	0.390	0.387	0.323	0.574	0.284	0.234	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11: Robustness 3 - Farm Size Check

VARIABLES	(1) prep_labor	(2) prep_labor	(3) hired_prep_labor	(4) hired_prep_labor	(5) harv_labor	(6) harv_labor	(7) hired_harv_labor	(8) hired_harv_labor
area_planted	0.353***	0.292***	0.152***	0.127***	0.272***	0.200***	0.107***	0.0836***
	(0.0158)	(0.0256)	(0.0147)	(0.0227)	(0.0175)	(0.0270)	(0.0120)	(0.0184)
plot_expense	0.00302	0.0221***	0.117***	0.115***	0.00961***	0.0268***	0.0580***	0.0513***
	(0.00200)	(0.00337)	(0.00178)	(0.00365)	(0.00210)	(0.00349)	(0.00146)	(0.00279)
collective_plot	0.471***	0.499***	-0.0955**	-0.192**	0.398***	0.395***	-0.0321	0.00364
	(0.0572)	(0.103)	(0.0483)	(0.0877)	(0.0576)	(0.103)	(0.0375)	(0.0715)
rented_in	0.0942**	0.151**	-0.436***	-0.416***	0.0589	0.0688	-0.153***	-0.108
	(0.0419)	(0.0615)	(0.0504)	(0.0781)	(0.0488)	(0.0716)	(0.0413)	(0.0705)
irrigated	0.205***	-0.00417	0.0806	-0.106	0.129*	-0.209*	-0.0860	-0.0718
	(0.0649)	(0.0974)	(0.0656)	(0.122)	(0.0668)	(0.107)	(0.0542)	(0.0861)
soil_type	0.0625***	0.108***	-0.0100	-0.0346*	0.0414***	0.0570**	0.0504***	0.0360**
	(0.0131)	(0.0205)	(0.0112)	(0.0192)	(0.0136)	(0.0224)	(0.00921)	(0.0157)
soil_quality	-0.00706	0.00752	0.00244	-0.00975	-0.0245	0.00296	-0.0379***	-0.0138
	(0.0149)	(0.0241)	(0.0127)	(0.0212)	(0.0157)	(0.0271)	(0.0101)	(0.0162)
organic_fert	0.0235***	0.0473***	-0.0244***	-0.0324***	0.00805	0.0222***	-0.0160***	-0.0168***
	(0.00422)	(0.00635)	(0.00487)	(0.00707)	(0.00501)	(0.00760)	(0.00391)	(0.00650)
plot_slope	-0.00863	-0.00164	-0.00675	0.0135	-0.0345***	-0.0161	-0.0123**	0.00508
	(0.00893)	(0.0144)	(0.00758)	(0.0136)	(0.00941)	(0.0162)	(0.00609)	(0.0111)
intercropped	0.0177	-0.00996	0.0671***	0.0594**	-0.00572	-0.0144	0.0838***	0.0449**
	(0.0175)	(0.0256)	(0.0148)	(0.0236)	(0.0182)	(0.0283)	(0.0120)	(0.0196)
seed_type	0.203***	0.0616**	-0.102***	-0.301***	0.115***	-0.0323	-0.0260**	-0.143***
	(0.0152)	(0.0273)	(0.0137)	(0.0328)	(0.0162)	(0.0323)	(0.0109)	(0.0280)
dist_to_hh	0.00867***	0.0213***	0.0207***	0.0173***	-0.000540	0.0109***	0.0124***	0.00639**
	(0.00222)	(0.00373)	(0.00207)	(0.00347)	(0.00225)	(0.00377)	(0.00168)	(0.00272)
area_planted_op	-0.0111	-0.0286	-0.000393	-0.0391	-0.0120	-0.109***	-0.00915	-0.0682***
	(0.0157)	(0.0295)	(0.0146)	(0.0251)	(0.0164)	(0.0305)	(0.0121)	(0.0208)
plot_value	0.0137**	0.0725***	0.0337***	0.0254**	0.0269***	0.0931***	0.0210***	0.0344***
	(0.00641)	(0.0121)	(0.00521)	(0.0105)	(0.00640)	(0.0131)	(0.00392)	(0.00789)
2.pctile_tla	0.0563**	-0.0124	-0.00248	-0.0433	0.0837***	0.0841	0.00119	-0.0251
	(0.0268)	(0.0594)	(0.0229)	(0.0541)	(0.0291)	(0.0679)	(0.0173)	(0.0443)
3.pctile_tla	0.0565*	-0.0982	0.0275	0.0820	0.138***	0.101	0.0311	0.00432
	(0.0302)	(0.0780)	(0.0263)	(0.0696)	(0.0320)	(0.0865)	(0.0207)	(0.0532)
4.pctile_tla	0.0537	-0.0906	0.0311	0.116	0.195***	0.235**	0.0214	-0.00769
	(0.0328)	(0.0939)	(0.0295)	(0.0845)	(0.0351)	(0.105)	(0.0230)	(0.0668)
5.pctile_tla	-0.0840**	-0.171	0.145***	0.0480	0.204***	0.246*	0.0745***	-0.0731
	(0.0395)	(0.119)	(0.0365)	(0.116)	(0.0420)	(0.129)	(0.0284)	(0.0894)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.575	0.493	0.389	0.324	0.400	0.289	0.235	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Robustness 3 ctd - Farm Size Check

VARIABLES	(1) prep_labor	(2) prep_labor	(3) hired_prep_labor	(4) hired_prep_labor	(5) harv_labor	(6) harv_labor	(7) hired_harv_labor	(8) hired_harv_labor
value_all_other_plots	-0.0130***	-0.00469	0.00110	0.00252	-0.0105***	6.17e-05	0.00135	0.00175
	(0.00193)	(0.00486)	(0.00187)	(0.00511)	(0.00207)	(0.00575)	(0.00147)	(0.00403)
all_female	-0.208***	-0.189**	0.0740**	0.0619	-0.141***	-0.179*	0.0498*	0.00718
	(0.0428)	(0.0943)	(0.0347)	(0.0726)	(0.0434)	(0.0969)	(0.0272)	(0.0516)
mixed_gend_mgr	-0.182***	-0.275***	0.0118	0.184**	-0.235***	-0.318***	-0.00837	-0.0411
	(0.0595)	(0.107)	(0.0508)	(0.0926)	(0.0604)	(0.110)	(0.0395)	(0.0745)
educ_mgr	-0.0168	0.0150	0.0428***	0.0767***	0.0225	0.0498	0.0292***	0.0154
	(0.0156)	(0.0354)	(0.0130)	(0.0281)	(0.0155)	(0.0392)	(0.0110)	(0.0220)
age_mgr	1.080***	1.071***	0.0404**	-0.0517	0.722***	0.655***	0.0455***	0.0650**
	(0.0240)	(0.0524)	(0.0175)	(0.0374)	(0.0225)	(0.0526)	(0.0143)	(0.0294)
bmi_mgr	0.0102	-0.0103	-0.00801	0.00272	0.00360	0.0159	-0.0113	-0.0278
	(0.00913)	(0.0316)	(0.00862)	(0.0262)	(0.0102)	(0.0353)	(0.00693)	(0.0234)
mgr_is_head	-0.260***	-0.389***	0.0254	0.105	-0.135**	-0.130	-0.0552	-0.0339
	(0.0566)	(0.109)	(0.0439)	(0.0820)	(0.0541)	(0.103)	(0.0350)	(0.0679)
num_children	0.0505***	-0.00543	-0.0161***	0.0480**	0.0518***	0.000223	-0.0166***	-0.00456
	(0.00504)	(0.0191)	(0.00461)	(0.0208)	(0.00538)	(0.0223)	(0.00376)	(0.0182)
num_adult_members	0.0728***	0.0892***	-0.0579***	-0.0585**	0.0675***	0.0885***	-0.0405***	-0.00219
	(0.00797)	(0.0237)	(0.00680)	(0.0238)	(0.00818)	(0.0295)	(0.00559)	(0.0191)
num_old_members	-0.0668***	0.0287	-0.0129	0.0308	-0.0781***	-0.0140	-0.0191	0.00601
	(0.0200)	(0.0730)	(0.0170)	(0.0659)	(0.0210)	(0.0788)	(0.0136)	(0.0553)
density	-0.0301***	0.0206	0.0131*	-0.00819	-0.0265***	0.0367**	0.00254	0.00109
	(0.00954)	(0.0140)	(0.00709)	(0.0120)	(0.00932)	(0.0150)	(0.00555)	(0.00936)
hh_assets	-0.0739***	-0.0289**	0.0540***	-0.000683	-0.0504***	-0.0282*	0.0289***	0.00906
	(0.00629)	(0.0136)	(0.00520)	(0.0119)	(0.00646)	(0.0149)	(0.00410)	(0.00909)
farm_assets	0.00114	0.00121	0.000161	0.00525	0.00608***	0.00626	-0.00160	-0.00422
	(0.00193)	(0.00400)	(0.00169)	(0.00372)	(0.00200)	(0.00452)	(0.00134)	(0.00294)
animal_units	-0.00923	0.0859***	0.0417***	-0.0651*	0.00553	0.0730**	0.0461***	-0.0270
	(0.0103)	(0.0317)	(0.0104)	(0.0334)	(0.0112)	(0.0351)	(0.00889)	(0.0288)
age_hh_head	-0.483***	-0.607***	-0.00784	0.119	-0.290***	-0.228	-0.0422	0.00366
	(0.0415)	(0.140)	(0.0328)	(0.151)	(0.0412)	(0.160)	(0.0268)	(0.114)
educ_hh_head	-0.0509***	0.0223	-0.0209*	-0.0634	-0.0557***	-0.0676	-0.0324***	0.0249
	(0.0140)	(0.0468)	(0.0115)	(0.0390)	(0.0137)	(0.0448)	(0.0103)	(0.0339)
gender_hh_head	-0.157***	-0.275**	0.0141	0.0230	-0.0523	-0.104	0.0292	0.0559
	(0.0340)	(0.120)	(0.0260)	(0.120)	(0.0349)	(0.127)	(0.0202)	(0.0884)
hh_death	-0.0325	-0.0595	0.0302	0.0620	0.0302	-0.0503	0.0285	0.0355
	(0.0307)	(0.0722)	(0.0265)	(0.0651)	(0.0322)	(0.0705)	(0.0217)	(0.0515)
ag_wage	0.0197*	-0.0252	-0.0294***	-0.0148	-0.00743	-0.0263	0.00247	0.00108
	(0.0117)	(0.0216)	(0.0101)	(0.0214)	(0.0126)	(0.0241)	(0.00785)	(0.0161)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.575	0.493	0.389	0.324	0.400	0.289	0.235	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Table 11: Robustness 3 ctd - Farm Size Check

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	prep_labor	prep_labor	hired_prep_labor	hired_prep_labor	harv_labor	harv_labor	hired_harv_labor	hired_harv_labor
2.interview_month	-0.0247	0.0700	0.0647*	0.0608	0.0887**	0.207**	0.0638**	0.0760
	(0.0401)	(0.0857)	(0.0344)	(0.0928)	(0.0420)	(0.0968)	(0.0277)	(0.0671)
3.interview_month	0.111***	0.0717	0.0561	0.167	0.0937**	0.169	0.0667**	0.0975
	(0.0421)	(0.0990)	(0.0373)	(0.104)	(0.0445)	(0.113)	(0.0300)	(0.0769)
4.interview_month	0.00976	0.0108	0.0155	0.0270	0.0828*	0.0663	0.0452	0.0350
	(0.0403)	(0.133)	(0.0363)	(0.128)	(0.0428)	(0.139)	(0.0293)	(0.0941)
5.interview_month	0.0836**	0.0226	-0.0320	-0.166	0.100**	-0.0372	0.0391	-0.0851
	(0.0383)	(0.136)	(0.0333)	(0.134)	(0.0405)	(0.147)	(0.0259)	(0.106)
6.interview_month	0.139***	0.132	0.0314	-0.124	0.177***	0.0606	0.0135	-0.0566
	(0.0412)	(0.142)	(0.0346)	(0.138)	(0.0429)	(0.152)	(0.0273)	(0.110)
7.interview_month	0.0301	-0.148	-0.0470	-0.170	0.133***	-0.0215	0.0204	-0.0572
	(0.0379)	(0.152)	(0.0340)	(0.143)	(0.0401)	(0.157)	(0.0269)	(0.122)
8.interview_month	0.185***	-0.0242	-0.0119	-0.0390	0.170***	0.430***	0.0534*	-0.107
	(0.0383)	(0.158)	(0.0348)	(0.153)	(0.0411)	(0.165)	(0.0291)	(0.138)
9.interview_month	0.157***	-0.246	-0.0406	-0.0280	0.111*	0.259	0.0569	-0.0743
	(0.0581)	(0.180)	(0.0499)	(0.192)	(0.0580)	(0.182)	(0.0403)	(0.167)
10.interview_month	0.0604	0.0485	-0.00298	0.0246	0.0631	0.224	0.00251	-0.00970
	(0.0389)	(0.133)	(0.0332)	(0.124)	(0.0407)	(0.146)	(0.0259)	(0.0889)
11.interview_month	0.0889**	0.179	0.0632**	0.00694	0.139***	0.131	0.0791***	0.0519
	(0.0384)	(0.128)	(0.0319)	(0.104)	(0.0400)	(0.127)	(0.0261)	(0.0842)
12.interview_month	0.120***	0.258**	0.0180	0.0857	0.131***	-0.0299	0.0373	0.0136
	(0.0380)	(0.101)	(0.0315)	(0.0804)	(0.0399)	(0.107)	(0.0247)	(0.0680)
Constant	0.839**	1.169	-0.743	-0.105	0.186	0.433	-0.773***	-0.601
	(0.408)	(0.875)	(0.490)	(0.802)	(0.871)	(0.836)	(0.243)	(0.608)
Observations	16,999	10,417	16,999	10,417	16,999	10,417	16,999	10,417
R-squared	0.575	0.493	0.389	0.324	0.400	0.289	0.235	0.164
Number of y2_hhid		2,727		2,727		2,727		2,727

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1