

HW1

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```
# Load packages
pacman::p_load(tidyverse, here, haven, magrittr)

# Load data
burk_df = read_dta(here("HW1", "data", "burkina731.dta"))

# Change appropriate variables to factors
burk_df %<>% mutate(village = as.factor(village),
                    year = as.factor(year),
                    fcrop = as.factor(fcrop),
                    hhn = as.factor(hhn),
                    hhn_unique = hhn:village)
```

Question 4

```
# We're doing this cumbersome method to put the formula in because I thought it was cool, but mostly be

# Get vector of all control variables for ease of use
x = c(grep('soil', names(burk_df), value = TRUE), grep('topo', names(burk_df), value = TRUE), grep('loc

# Add village fixed effects
village = c(x, "village*year*fcrop")

# Function that outputs regression formula
formula_generator = function(y = "lnvalue", x){
  a = paste(y, "~", sep = " ")
  paste(a, paste(paste0(x), collapse = " + ")) |> as.formula()
}

# Village fixed effects formula
village_formula = formula_generator('lnvalue', village)
# Estimate first regression.
village_reg = lm(village_formula, burk_df)

# Now add household fixed effects
household = c(x, "hhn*year*fcrop")

# Formula
household_formula = formula_generator('lnvalue', household)
```

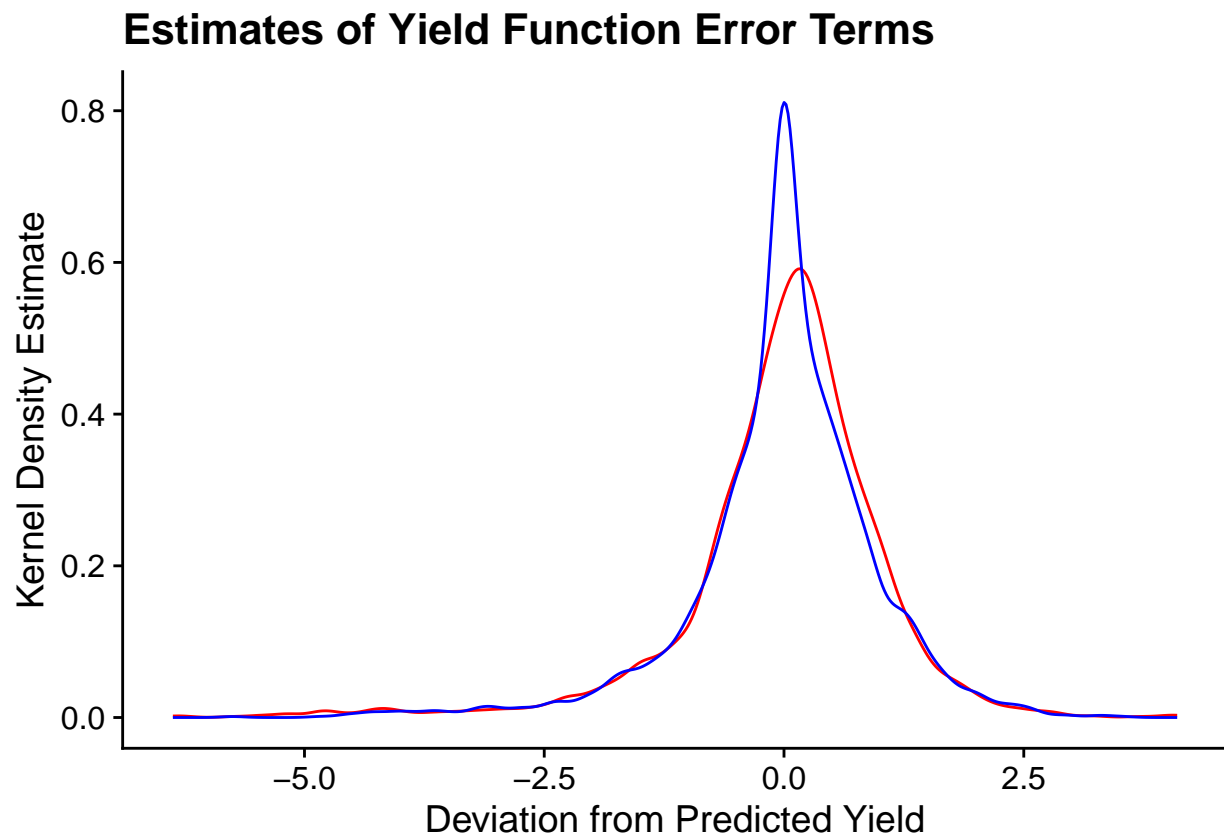
```

# Regression
household_reg = lm(household_formula, data = burk_df)

# Graph the density of residuals from each regression
resids = tibble(village = village_reg$residuals, household = household_reg$residuals)

# Graph residuals
resids |>
  ggplot(aes(village)) +
  geom_density(col = 'red') +
  geom_density(aes(x = household), col = 'blue') +
  xlab("Deviation from Predicted Yield") + ylab("Kernel Density Estimate") +
  ggtitle("Estimates of Yield Function Error Terms") +
  cowplot::theme_cowplot()

```



```

# Test if distributions are different using KS test
with(resids, ks.test(village, household)) # Reject

```

```

## Warning in ks.test.default(village, household): p-value will be approximate in
## the presence of ties

```

```

##
## Asymptotic two-sample Kolmogorov-Smirnov test
##

```

```
## data: village and household
## D = 0.078416, p-value = 2.641e-07
## alternative hypothesis: two-sided
```

Question 5

```
# Add log of hh size of other plots to data
hhsizesize = c("lnhhsizesize", x, "village*year*fcrop")
```

```
# Formula
hhsizesize_formula = formula_generator('lnvalue', hhsizesize)
# Run regression
other_reg = lm(hhsizesize_formula, burk_df)
summary(other_reg)
```

```
##
## Call:
## lm(formula = hhsizesize_formula, data = burk_df)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.0872 -0.3911  0.1214  0.5671  3.9816
##
## Coefficients: (226 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.953932   0.303290   9.740 < 2e-16 ***
## lnhhsizesize      0.174497   0.040388   4.320 1.63e-05 ***
## soil7            -0.185085   0.138588  -1.336 0.181857
## soil21            0.334016   0.218695   1.527 0.126833
## soil31            0.094384   0.160900   0.587 0.557537
## soil32           -0.020781   0.163379  -0.127 0.898799
## soil33            0.157360   0.219685   0.716 0.473888
## soil37            0.139808   0.208954   0.669 0.503513
## soil35            0.037521   0.292574   0.128 0.897967
## soil45            0.025093   0.172441   0.146 0.884316
## soil51            0.116734   0.098102   1.190 0.234212
## soil1             0.130808   0.463260   0.282 0.777693
## soil3            -0.152436   0.134633  -1.132 0.257666
## soil11           -0.299804   0.252798  -1.186 0.235780
## soil12            0.008792   0.239190   0.037 0.970681
## soil13            0.326383   0.293937   1.110 0.266961
## soil34           -0.361505   0.359567  -1.005 0.314826
## soil46           -0.315251   0.257260  -1.225 0.220556
## soil53            0.400923   0.216994   1.848 0.064798 .
## topo1            -0.475164   0.166265  -2.858 0.004307 **
## topo2            -0.316018   0.149974  -2.107 0.035223 *
## topo3            -0.282483   0.147303  -1.918 0.055285 .
## topo4           -0.233111   0.145424  -1.603 0.109092
## loc1              0.192384   0.083745   2.297 0.021702 *
## loc2              0.108107   0.062054   1.742 0.081629 .
## lnarea            0.801600   0.027597  29.047 < 2e-16 ***
## village2          0.108706   0.268282   0.405 0.685376
```

## village3	0.038698	0.380412	0.102	0.918984	
## village4	-0.405748	0.372149	-1.090	0.275715	
## village5	0.210414	0.366856	0.574	0.566327	
## village6	0.601326	0.422008	1.425	0.154331	
## year2	-0.982707	0.300866	-3.266	0.001107	**
## year3	0.159812	0.303215	0.527	0.598210	
## fcrop2	-0.345452	0.483096	-0.715	0.474640	
## fcrop3	-1.233119	0.370490	-3.328	0.000889	***
## fcrop4	-1.141998	0.692329	-1.650	0.099195	.
## fcrop5	-0.195300	0.359296	-0.544	0.586799	
## fcrop6	0.649245	0.728340	0.891	0.372815	
## fcrop7	0.256602	0.429803	0.597	0.550557	
## fcrop8	-0.904873	0.684087	-1.323	0.186064	
## fcrop9	-1.834625	0.709061	-2.587	0.009737	**
## fcrop11	-2.189504	0.544132	-4.024	5.93e-05	***
## fcrop12	-0.101127	0.818696	-0.124	0.901706	
## fcrop15	0.553959	1.161226	0.477	0.633379	
## fcrop16	-2.795806	0.846429	-3.303	0.000972	***
## fcrop18	0.021861	1.148197	0.019	0.984811	
## fcrop20	-2.163290	0.646011	-3.349	0.000826	***
## fcrop22	-2.375288	0.837037	-2.838	0.004587	**
## fcrop24	-1.580683	1.130724	-1.398	0.162279	
## fcrop25	-2.947858	1.150958	-2.561	0.010500	*
## fcrop31	0.068667	0.353733	0.194	0.846100	
## fcrop32	-1.817951	1.127860	-1.612	0.107143	
## fcrop44	1.563614	0.607135	2.575	0.010081	*
## village2:year2	0.047261	0.376919	0.125	0.900228	
## village3:year2	-0.001006	0.393878	-0.003	0.997963	
## village4:year2	0.955184	0.411286	2.322	0.020305	*
## village5:year2	-0.095954	0.409053	-0.235	0.814561	
## village6:year2	-0.572311	0.502577	-1.139	0.254936	
## village2:year3	-0.390616	0.374217	-1.044	0.296689	
## village3:year3	NA	NA	NA	NA	
## village4:year3	0.033092	0.407388	0.081	0.935267	
## village5:year3	NA	NA	NA	NA	
## village6:year3	-0.601841	0.499380	-1.205	0.228271	
## village2:fcrop2	0.470685	0.572054	0.823	0.410717	
## village3:fcrop2	0.980590	0.492037	1.993	0.046400	*
## village4:fcrop2	0.347717	0.549557	0.633	0.526984	
## village5:fcrop2	0.582572	0.482452	1.208	0.227368	
## village6:fcrop2	0.069251	0.605607	0.114	0.908971	
## village2:fcrop3	NA	NA	NA	NA	
## village3:fcrop3	0.279897	0.485219	0.577	0.564105	
## village4:fcrop3	1.612200	0.560670	2.875	0.004075	**
## village5:fcrop3	0.145632	0.469405	0.310	0.756404	
## village6:fcrop3	NA	NA	NA	NA	
## village2:fcrop4	-1.835730	1.310690	-1.401	0.161487	
## village3:fcrop4	0.416641	0.824826	0.505	0.613523	
## village4:fcrop4	0.989085	0.899021	1.100	0.271380	
## village5:fcrop4	NA	NA	NA	NA	
## village6:fcrop4	1.138860	1.071779	1.063	0.288091	
## village2:fcrop5	-0.639217	0.425086	-1.504	0.132801	
## village3:fcrop5	-0.728754	0.451091	-1.616	0.106345	
## village4:fcrop5	1.190194	0.453812	2.623	0.008788	**

## village5:fcrop5	-0.816379	0.445720	-1.832	0.067154	.
## village6:fcrop5	1.795962	0.506120	3.548	0.000396	***
## village2:fcrop6	-0.933022	0.880717	-1.059	0.289545	
## village3:fcrop6	0.256922	1.218872	0.211	0.833074	
## village4:fcrop6	-0.019129	1.216545	-0.016	0.987456	
## village5:fcrop6	0.821994	0.732843	1.122	0.262140	
## village6:fcrop6	NA	NA	NA	NA	
## village2:fcrop7	0.533608	0.533845	1.000	0.317641	
## village3:fcrop7	NA	NA	NA	NA	
## village4:fcrop7	NA	NA	NA	NA	
## village5:fcrop7	NA	NA	NA	NA	
## village6:fcrop7	NA	NA	NA	NA	
## village2:fcrop8	1.155532	0.807472	1.431	0.152565	
## village3:fcrop8	0.487417	1.016036	0.480	0.631474	
## village4:fcrop8	1.722305	0.748126	2.302	0.021424	*
## village5:fcrop8	-0.643196	0.968478	-0.664	0.506680	
## village6:fcrop8	0.360760	0.798826	0.452	0.651595	
## village2:fcrop9	1.304949	1.323397	0.986	0.324218	
## village3:fcrop9	NA	NA	NA	NA	
## village4:fcrop9	NA	NA	NA	NA	
## village5:fcrop9	-1.340424	0.799997	-1.676	0.093978	.
## village6:fcrop9	NA	NA	NA	NA	
## village2:fcrop11	NA	NA	NA	NA	
## village3:fcrop11	NA	NA	NA	NA	
## village4:fcrop11	NA	NA	NA	NA	
## village5:fcrop11	0.131946	1.221324	0.108	0.913978	
## village6:fcrop11	NA	NA	NA	NA	
## village2:fcrop12	1.020103	1.038275	0.982	0.325968	
## village3:fcrop12	NA	NA	NA	NA	
## village4:fcrop12	NA	NA	NA	NA	
## village5:fcrop12	-4.880239	1.366113	-3.572	0.000362	***
## village6:fcrop12	-2.495663	0.993539	-2.512	0.012083	*
## village2:fcrop15	NA	NA	NA	NA	
## village3:fcrop15	3.656412	1.342439	2.724	0.006509	**
## village4:fcrop15	0.798456	1.220442	0.654	0.513032	
## village5:fcrop15	0.708707	1.702546	0.416	0.677260	
## village6:fcrop15	NA	NA	NA	NA	
## village2:fcrop16	NA	NA	NA	NA	
## village3:fcrop16	3.894919	1.274716	3.056	0.002275	**
## village4:fcrop16	NA	NA	NA	NA	
## village5:fcrop16	NA	NA	NA	NA	
## village6:fcrop16	NA	NA	NA	NA	
## village2:fcrop18	NA	NA	NA	NA	
## village3:fcrop18	NA	NA	NA	NA	
## village4:fcrop18	NA	NA	NA	NA	
## village5:fcrop18	-2.362589	1.398188	-1.690	0.091225	.
## village6:fcrop18	NA	NA	NA	NA	
## village2:fcrop20	NA	NA	NA	NA	
## village3:fcrop20	NA	NA	NA	NA	
## village4:fcrop20	NA	NA	NA	NA	
## village5:fcrop20	NA	NA	NA	NA	
## village6:fcrop20	NA	NA	NA	NA	
## village2:fcrop22	3.032914	0.945903	3.206	0.001364	**
## village3:fcrop22	NA	NA	NA	NA	

## village4:fcrop22	NA	NA	NA	NA
## village5:fcrop22	4.589952	1.607105	2.856	0.004332 **
## village6:fcrop22	NA	NA	NA	NA
## village2:fcrop24	NA	NA	NA	NA
## village3:fcrop24	NA	NA	NA	NA
## village4:fcrop24	NA	NA	NA	NA
## village5:fcrop24	NA	NA	NA	NA
## village6:fcrop24	NA	NA	NA	NA
## village2:fcrop25	NA	NA	NA	NA
## village3:fcrop25	NA	NA	NA	NA
## village4:fcrop25	NA	NA	NA	NA
## village5:fcrop25	NA	NA	NA	NA
## village6:fcrop25	NA	NA	NA	NA
## village2:fcrop31	NA	NA	NA	NA
## village3:fcrop31	-0.967722	1.167198	-0.829	0.407143
## village4:fcrop31	NA	NA	NA	NA
## village5:fcrop31	-0.168506	0.400410	-0.421	0.673920
## village6:fcrop31	NA	NA	NA	NA
## village2:fcrop32	NA	NA	NA	NA
## village3:fcrop32	NA	NA	NA	NA
## village4:fcrop32	NA	NA	NA	NA
## village5:fcrop32	NA	NA	NA	NA
## village6:fcrop32	NA	NA	NA	NA
## village2:fcrop44	NA	NA	NA	NA
## village3:fcrop44	NA	NA	NA	NA
## village4:fcrop44	NA	NA	NA	NA
## village5:fcrop44	1.541424	1.054063	1.462	0.143792
## village6:fcrop44	NA	NA	NA	NA
## year2:fcrop2	-0.301763	0.620645	-0.486	0.626870
## year3:fcrop2	-0.239410	0.591513	-0.405	0.685709
## year2:fcrop3	1.327225	0.504535	2.631	0.008586 **
## year3:fcrop3	1.201958	0.531331	2.262	0.023789 *
## year2:fcrop4	NA	NA	NA	NA
## year3:fcrop4	NA	NA	NA	NA
## year2:fcrop5	0.039560	0.495595	0.080	0.936385
## year3:fcrop5	1.311789	0.484244	2.709	0.006805 **
## year2:fcrop6	-0.332435	0.830848	-0.400	0.689113
## year3:fcrop6	-0.053435	0.820579	-0.065	0.948086
## year2:fcrop7	0.402674	1.198518	0.336	0.736922
## year3:fcrop7	1.218601	1.196341	1.019	0.308508
## year2:fcrop8	0.898855	0.582476	1.543	0.122942
## year3:fcrop8	1.064320	0.573605	1.855	0.063666 .
## year2:fcrop9	2.867053	0.931644	3.077	0.002115 **
## year3:fcrop9	1.195069	0.895198	1.335	0.182029
## year2:fcrop11	1.671990	0.730497	2.289	0.022188 *
## year3:fcrop11	1.278666	0.728114	1.756	0.079212 .
## year2:fcrop12	1.798733	1.001717	1.796	0.072695 .
## year3:fcrop12	1.982637	1.001160	1.980	0.047796 *
## year2:fcrop15	0.752099	1.623522	0.463	0.643232
## year3:fcrop15	-2.905148	0.579131	-5.016	5.71e-07 ***
## year2:fcrop16	1.412678	1.409065	1.003	0.316187
## year3:fcrop16	0.209595	1.581175	0.133	0.894557
## year2:fcrop18	2.664505	1.133559	2.351	0.018837 *
## year3:fcrop18	NA	NA	NA	NA

## year2:fcrop20	2.464977	0.881292	2.797	0.005205	**
## year3:fcrop20	NA	NA	NA	NA	
## year2:fcrop22	1.138841	1.402733	0.812	0.416957	
## year3:fcrop22	0.219825	1.208462	0.182	0.855675	
## year2:fcrop24	3.322126	1.594384	2.084	0.037314	*
## year3:fcrop24	NA	NA	NA	NA	
## year2:fcrop25	NA	NA	NA	NA	
## year3:fcrop25	NA	NA	NA	NA	
## year2:fcrop31	1.221157	0.458757	2.662	0.007830	**
## year3:fcrop31	0.371342	0.460939	0.806	0.420553	
## year2:fcrop32	NA	NA	NA	NA	
## year3:fcrop32	NA	NA	NA	NA	
## year2:fcrop44	0.430577	0.742038	0.580	0.561799	
## year3:fcrop44	-2.768646	0.903068	-3.066	0.002198	**
## village2:year2:fcrop2	0.111006	0.785586	0.141	0.887644	
## village3:year2:fcrop2	0.278377	0.657388	0.423	0.672004	
## village4:year2:fcrop2	0.844562	0.715213	1.181	0.237795	
## village5:year2:fcrop2	0.022628	0.662856	0.034	0.972771	
## village6:year2:fcrop2	0.872929	0.792690	1.101	0.270926	
## village2:year3:fcrop2	0.003649	0.811122	0.004	0.996411	
## village3:year3:fcrop2	NA	NA	NA	NA	
## village4:year3:fcrop2	0.367096	0.687529	0.534	0.593443	
## village5:year3:fcrop2	NA	NA	NA	NA	
## village6:year3:fcrop2	0.642734	0.768501	0.836	0.403055	
## village2:year2:fcrop3	NA	NA	NA	NA	
## village3:year2:fcrop3	0.541641	0.662534	0.818	0.413719	
## village4:year2:fcrop3	-1.045578	0.782554	-1.336	0.181658	
## village5:year2:fcrop3	0.510842	0.672862	0.759	0.447814	
## village6:year2:fcrop3	NA	NA	NA	NA	
## village2:year3:fcrop3	NA	NA	NA	NA	
## village3:year3:fcrop3	NA	NA	NA	NA	
## village4:year3:fcrop3	-1.489607	0.766694	-1.943	0.052163	.
## village5:year3:fcrop3	NA	NA	NA	NA	
## village6:year3:fcrop3	NA	NA	NA	NA	
## village2:year2:fcrop4	NA	NA	NA	NA	
## village3:year2:fcrop4	NA	NA	NA	NA	
## village4:year2:fcrop4	NA	NA	NA	NA	
## village5:year2:fcrop4	NA	NA	NA	NA	
## village6:year2:fcrop4	NA	NA	NA	NA	
## village2:year3:fcrop4	NA	NA	NA	NA	
## village3:year3:fcrop4	NA	NA	NA	NA	
## village4:year3:fcrop4	NA	NA	NA	NA	
## village5:year3:fcrop4	NA	NA	NA	NA	
## village6:year3:fcrop4	NA	NA	NA	NA	
## village2:year2:fcrop5	-0.509025	0.624077	-0.816	0.414796	
## village3:year2:fcrop5	2.217819	0.636382	3.485	0.000502	***
## village4:year2:fcrop5	0.099616	0.644718	0.155	0.877222	
## village5:year2:fcrop5	2.091436	0.643832	3.248	0.001179	**
## village6:year2:fcrop5	-0.805097	0.686271	-1.173	0.240870	
## village2:year3:fcrop5	-1.777937	0.605533	-2.936	0.003359	**
## village3:year3:fcrop5	NA	NA	NA	NA	
## village4:year3:fcrop5	-1.927500	0.625309	-3.082	0.002080	**
## village5:year3:fcrop5	NA	NA	NA	NA	
## village6:year3:fcrop5	-2.722996	0.671963	-4.052	5.26e-05	***

## village2:year2:fcrop6	0.429425	1.120845	0.383	0.701665	
## village3:year2:fcrop6	-3.418046	1.409720	-2.425	0.015408	*
## village4:year2:fcrop6	NA	NA	NA	NA	
## village5:year2:fcrop6	-1.733368	0.969497	-1.788	0.073936	.
## village6:year2:fcrop6	NA	NA	NA	NA	
## village2:year3:fcrop6	0.704150	1.248835	0.564	0.572920	
## village3:year3:fcrop6	NA	NA	NA	NA	
## village4:year3:fcrop6	NA	NA	NA	NA	
## village5:year3:fcrop6	NA	NA	NA	NA	
## village6:year3:fcrop6	NA	NA	NA	NA	
## village2:year2:fcrop7	-0.768131	1.474027	-0.521	0.602345	
## village3:year2:fcrop7	NA	NA	NA	NA	
## village4:year2:fcrop7	NA	NA	NA	NA	
## village5:year2:fcrop7	NA	NA	NA	NA	
## village6:year2:fcrop7	NA	NA	NA	NA	
## village2:year3:fcrop7	-0.726819	1.663714	-0.437	0.662254	
## village3:year3:fcrop7	NA	NA	NA	NA	
## village4:year3:fcrop7	NA	NA	NA	NA	
## village5:year3:fcrop7	NA	NA	NA	NA	
## village6:year3:fcrop7	NA	NA	NA	NA	
## village2:year2:fcrop8	-0.610708	1.085181	-0.563	0.573651	
## village3:year2:fcrop8	0.570307	0.851461	0.670	0.503061	
## village4:year2:fcrop8	-1.055004	0.736868	-1.432	0.152368	
## village5:year2:fcrop8	1.647409	0.899945	1.831	0.067307	.
## village6:year2:fcrop8	NA	NA	NA	NA	
## village2:year3:fcrop8	NA	NA	NA	NA	
## village3:year3:fcrop8	NA	NA	NA	NA	
## village4:year3:fcrop8	-1.401606	0.741038	-1.891	0.058708	.
## village5:year3:fcrop8	NA	NA	NA	NA	
## village6:year3:fcrop8	NA	NA	NA	NA	
## village2:year2:fcrop9	NA	NA	NA	NA	
## village3:year2:fcrop9	NA	NA	NA	NA	
## village4:year2:fcrop9	NA	NA	NA	NA	
## village5:year2:fcrop9	1.439062	1.510524	0.953	0.340857	
## village6:year2:fcrop9	NA	NA	NA	NA	
## village2:year3:fcrop9	NA	NA	NA	NA	
## village3:year3:fcrop9	NA	NA	NA	NA	
## village4:year3:fcrop9	NA	NA	NA	NA	
## village5:year3:fcrop9	NA	NA	NA	NA	
## village6:year3:fcrop9	NA	NA	NA	NA	
## village2:year2:fcrop11	NA	NA	NA	NA	
## village3:year2:fcrop11	NA	NA	NA	NA	
## village4:year2:fcrop11	NA	NA	NA	NA	
## village5:year2:fcrop11	NA	NA	NA	NA	
## village6:year2:fcrop11	NA	NA	NA	NA	
## village2:year3:fcrop11	NA	NA	NA	NA	
## village3:year3:fcrop11	NA	NA	NA	NA	
## village4:year3:fcrop11	NA	NA	NA	NA	
## village5:year3:fcrop11	NA	NA	NA	NA	
## village6:year3:fcrop11	NA	NA	NA	NA	
## village2:year2:fcrop12	NA	NA	NA	NA	
## village3:year2:fcrop12	NA	NA	NA	NA	
## village4:year2:fcrop12	NA	NA	NA	NA	
## village5:year2:fcrop12	3.127968	1.483188	2.109	0.035067	*

## village6:year2:fcrop12	NA	NA	NA	NA
## village2:year3:fcrop12	-2.744067	1.632575	-1.681	0.092947 .
## village3:year3:fcrop12	NA	NA	NA	NA
## village4:year3:fcrop12	NA	NA	NA	NA
## village5:year3:fcrop12	NA	NA	NA	NA
## village6:year3:fcrop12	NA	NA	NA	NA
## village2:year2:fcrop15	NA	NA	NA	NA
## village3:year2:fcrop15	-3.652010	1.800545	-2.028	0.042658 *
## village4:year2:fcrop15	-0.247572	1.714774	-0.144	0.885218
## village5:year2:fcrop15	0.652379	2.332054	0.280	0.779701
## village6:year2:fcrop15	NA	NA	NA	NA
## village2:year3:fcrop15	NA	NA	NA	NA
## village3:year3:fcrop15	NA	NA	NA	NA
## village4:year3:fcrop15	NA	NA	NA	NA
## village5:year3:fcrop15	NA	NA	NA	NA
## village6:year3:fcrop15	NA	NA	NA	NA
## village2:year2:fcrop16	NA	NA	NA	NA
## village3:year2:fcrop16	NA	NA	NA	NA
## village4:year2:fcrop16	NA	NA	NA	NA
## village5:year2:fcrop16	NA	NA	NA	NA
## village6:year2:fcrop16	NA	NA	NA	NA
## village2:year3:fcrop16	NA	NA	NA	NA
## village3:year3:fcrop16	NA	NA	NA	NA
## village4:year3:fcrop16	NA	NA	NA	NA
## village5:year3:fcrop16	NA	NA	NA	NA
## village6:year3:fcrop16	NA	NA	NA	NA
## village2:year2:fcrop18	NA	NA	NA	NA
## village3:year2:fcrop18	NA	NA	NA	NA
## village4:year2:fcrop18	NA	NA	NA	NA
## village5:year2:fcrop18	NA	NA	NA	NA
## village6:year2:fcrop18	NA	NA	NA	NA
## village2:year3:fcrop18	NA	NA	NA	NA
## village3:year3:fcrop18	NA	NA	NA	NA
## village4:year3:fcrop18	NA	NA	NA	NA
## village5:year3:fcrop18	NA	NA	NA	NA
## village6:year3:fcrop18	NA	NA	NA	NA
## village2:year2:fcrop20	NA	NA	NA	NA
## village3:year2:fcrop20	NA	NA	NA	NA
## village4:year2:fcrop20	NA	NA	NA	NA
## village5:year2:fcrop20	NA	NA	NA	NA
## village6:year2:fcrop20	NA	NA	NA	NA
## village2:year3:fcrop20	NA	NA	NA	NA
## village3:year3:fcrop20	NA	NA	NA	NA
## village4:year3:fcrop20	NA	NA	NA	NA
## village5:year3:fcrop20	NA	NA	NA	NA
## village6:year3:fcrop20	NA	NA	NA	NA
## village2:year2:fcrop22	-2.130195	1.856134	-1.148	0.251244
## village3:year2:fcrop22	NA	NA	NA	NA
## village4:year2:fcrop22	NA	NA	NA	NA
## village5:year2:fcrop22	-0.322185	2.055319	-0.157	0.875452
## village6:year2:fcrop22	NA	NA	NA	NA
## village2:year3:fcrop22	NA	NA	NA	NA
## village3:year3:fcrop22	NA	NA	NA	NA
## village4:year3:fcrop22	NA	NA	NA	NA

```

## village5:year3:fcrop22      NA      NA      NA      NA
## village6:year3:fcrop22      NA      NA      NA      NA
## village2:year2:fcrop24      NA      NA      NA      NA
## village3:year2:fcrop24      NA      NA      NA      NA
## village4:year2:fcrop24      NA      NA      NA      NA
## village5:year2:fcrop24      NA      NA      NA      NA
## village6:year2:fcrop24      NA      NA      NA      NA
## village2:year3:fcrop24      NA      NA      NA      NA
## village3:year3:fcrop24      NA      NA      NA      NA
## village4:year3:fcrop24      NA      NA      NA      NA
## village5:year3:fcrop24      NA      NA      NA      NA
## village6:year3:fcrop24      NA      NA      NA      NA
## village2:year2:fcrop25      NA      NA      NA      NA
## village3:year2:fcrop25      NA      NA      NA      NA
## village4:year2:fcrop25      NA      NA      NA      NA
## village5:year2:fcrop25      NA      NA      NA      NA
## village6:year2:fcrop25      NA      NA      NA      NA
## village2:year3:fcrop25      NA      NA      NA      NA
## village3:year3:fcrop25      NA      NA      NA      NA
## village4:year3:fcrop25      NA      NA      NA      NA
## village5:year3:fcrop25      NA      NA      NA      NA
## village6:year3:fcrop25      NA      NA      NA      NA
## village2:year2:fcrop31      NA      NA      NA      NA
## village3:year2:fcrop31      1.213658  1.645176  0.738 0.460775
## village4:year2:fcrop31      NA      NA      NA      NA
## village5:year2:fcrop31      0.602292  0.570358  1.056 0.291095
## village6:year2:fcrop31      NA      NA      NA      NA
## village2:year3:fcrop31      NA      NA      NA      NA
## village3:year3:fcrop31      NA      NA      NA      NA
## village4:year3:fcrop31      NA      NA      NA      NA
## village5:year3:fcrop31      NA      NA      NA      NA
## village6:year3:fcrop31      NA      NA      NA      NA
## village2:year2:fcrop32      NA      NA      NA      NA
## village3:year2:fcrop32      NA      NA      NA      NA
## village4:year2:fcrop32      NA      NA      NA      NA
## village5:year2:fcrop32      NA      NA      NA      NA
## village6:year2:fcrop32      NA      NA      NA      NA
## village2:year3:fcrop32      NA      NA      NA      NA
## village3:year3:fcrop32      NA      NA      NA      NA
## village4:year3:fcrop32      NA      NA      NA      NA
## village5:year3:fcrop32      NA      NA      NA      NA
## village6:year3:fcrop32      NA      NA      NA      NA
## village2:year2:fcrop44      NA      NA      NA      NA
## village3:year2:fcrop44      NA      NA      NA      NA
## village4:year2:fcrop44      NA      NA      NA      NA
## village5:year2:fcrop44      -1.606997  1.284514  -1.251 0.211054
## village6:year2:fcrop44      NA      NA      NA      NA
## village2:year3:fcrop44      NA      NA      NA      NA
## village3:year3:fcrop44      NA      NA      NA      NA
## village4:year3:fcrop44      NA      NA      NA      NA
## village5:year3:fcrop44      NA      NA      NA      NA
## village6:year3:fcrop44      NA      NA      NA      NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```
##  
## Residual standard error: 1.098 on 2093 degrees of freedom  
## (306 observations deleted due to missingness)  
## Multiple R-squared: 0.6702, Adjusted R-squared: 0.6424  
## F-statistic: 24.16 on 176 and 2093 DF, p-value: < 2.2e-16
```