**Agricultural Profits in Ghana**

**Statistical Analysis Paper**

ACME has shown interest in expanding agriculture inputs in Ghana. This study was performed to determine what factors have a significant role in determining agriculture profits in Ghana. The dataset used was the Ghana Living Standard Survey 4 from 1998-1999 which contains surveys from 300 economic areas (also called clusters) and 5997 households. This includes 195 rural and 105 urban economic areas. This study focused mostly on the rural EAs.

All analysis can be found in the R code file, ghana\_ag\_data\_analysis.R and includes many notes and comments about the analysis process. The overview of the relevant statistics and methods is provided here.

The data files from the survey data which were used in this study are:

sec0a.dta

sec2a.dta

sec9a1.dta

agg2.dta

exp3.dta

exp4.dta

exp5.dta

cs2.dta

cs4b.dta

cs5b.dta

The analysis began by organizing the data from all the files such that it could be combined (“tidied”). The common element in all the datasets is the cluster/EA. This factor was used to combine data and look across datasets.

**Education Tests and Models**

The first model created was to explore the effect household education has on agricultural profit. The explanatory variable chosen was household education rate. This variable looked at the variable s2aq1 ‘Ever attended school’ for every member of each household. The household education rate was determined by taking all ‘Yes’ answers to that question divided by the number of members in the household. The independent variable chosen was profit per acre instead of pure profit. This was chosen to normalize for the amount of land a household was using for agriculture.

The result of the profit per acre vs household education rate was significant. The linear model was chosen to test the effect and showed a p-value of 0.027. The slope of the trend line 481,354 which implies a 10-percentage point increase in household education rate translates to a 48,135 dollar increase in profit per acre.

The next model produced used secondary education as the explanatory variable. The variable looked at the highest education obtained for each member of each household. If any member had completed some secondary education, the variable was set true for the household.

The model for any secondary education in the household was not significant due to a very high p-value (0.9) so it can be concluded that having some secondary education does not have a significant impact on profit per acre. This high p-value was verified with a t-test on profit per acre vs secondary education. The t-test also showed the difference as insignificant, this time showing the average profit per acre has an insignificant difference for households with some secondary education versus ones which have none. The previous model showed that having more members of the household having any education is much more important and significant.

**Community Data Tests and Models**

The second set of models and tests explored community data. The community data was survey data by community and did not separate by households. The household data was consolidated by community so that the total household data from a community could be analyzed. The models explored the effect of having various services within the community. The only significant factors found from exploring the services in the communities were whether there were roads in the community, irrigation used in the community, banks in the community, and pesticides used in the community.

The p-value from the t-tests were:

|  |  |  |  |
| --- | --- | --- | --- |
|  | T-Test P Value for Profit per Acre | |  |
| Insecticides Used | Bank in Community | Irrigation Used | Roads in Community |
| 0.05306 | 4.36E-05 | 0.0004718 | 0.05444 |

These were the significant community factors determining profit per acre. For insecticides used, the profit per acre increases significantly when insecticides are used. For the other three factors however, the profit per acre decreases significantly when the factor is TRUE. This implies communities with banks and roads make less agriculture profit per acre, while communities which have irrigated fields make significantly less profit per acre.

Our interpretation of this is that communities without banks and roads are likely more rural and might be both more experienced in agricultural techniques as well as dedicating a higher percentage of acreage to agricultural use.

The significant decrease in profit for irrigated fields also was surprising but is likely explained by cost of irrigation. This would imply that investing in irrigation will not have a positive return on investment.

In conclusion, the statistically significant factors to agricultural profit per acre in Ghana are household education rate, community use of insecticides and irrigation, and the presence of banks and roads in the community.