Utilizing farmland sales data as a proxy for estimating the long-term benefits of cover crops

Robert Ellis
Graduate Research Assistant
University of Kentucky
Robert.Ellis@uky.edu

Tyler Mark
Assistant Professor
University of Kentucky
tyler.mark@uky.edu

Jordan Shockley
Assistant Professor
University of Kentucky
Jordan.shockley@uky.edu

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Abstract:

Soil erosion in the US is estimated to cost $44 billion and contributes to $100 million in lost farm income. Over time, a lack of soil erosion prevention in commercial grain farms are estimated to decrease crop yields, hence, decrease land values. A possible solution to prevent soil erosion on cropland is to adopt cover crops. However, due to lack of profitability, cover crops have not been widely adopted. Understanding how soil characteristics, like soil erosion, influence cropland values at the time of sale can serve as a proxy for valuing the long-term benefits of cover crops. A data set of farmland sales in Kentucky from 2005-2016 which includes land characteristics such as soil erosion rate will be used along with a hedonic model to understand the impact of soil erosion over time. This can serve as a proxy of how cover crops adoption in Kentucky can be valued for preventing soil erosion.

Introduction:

Cover Crops have become a new trend in farming. Although they have been used for a century a recent increase in their use has been seen over the last few years. This increase is still minimal regarding acres planted compared to that of other crops. However, some of this can be explained by the fact that cover crops are mostly a sunk cost regarding cash dollar amounts. Therefore, many agronomists have sought to find ways to prove that the use of cover crops will increase crops yields for cash crops. This statement is highly argued and still not consistent in results across various research projects. For that fact, this paper will not focus on the added benefits of crop increase with the use of cover crops but will look at the added benefit of cover crops in preventing soil erosion and adding organic matter.

The added benefit to increase organic matter in the soil and soil erosion prevention have both been proven in multiple agronomy research projects, but the amount of gain is up for debate. Although the amount is still unclear any increase in these two categories would result in a positive effect on land. The reason being that added organic matter and organic carbon would increase the fertility of the soil, and that the less erodible soil would result in a better soil structure from year to year.

With these ideas in mind, how do they relate to value on the farm? One way would be in the added value of the land. If the soil is more productive, then the value of the property will increase over time. One of the various ways in which land is categorized is using NRCS land capability classes. The system using the numbers one through eight to classify the capability of a given parcel of land. For efficiency purpose, this class can be broken down on a given farm in term of a total number of acres in each class and is often shown in the sale of a farm in that manner.

The land is graded as a one if highly productive and does not show very many limitations regarding crops grown on the land as the number increases the limits increase as well up to eight. Once the land reaches class 5, it is not suitable for crop production and is suited for pasture or forestland. A class 8 is not suitable for any farm production and is therefore not addressed in this study. However, due to the ownership of the land, this is not a 100% guarantee. The classes are not assigned an exact slope value, but using the NRCS definition, an overall slope can be shown.

An example would be a class one referring to as a gentle slope and a class four relating to a steep slope. To find the added value cover crops provide to the land. First, a base model must be established. This study will try to find the relationship of land class and land values for the state of Kentucky using farm sales data from 2008 through 2016. Once the base model is established further study can be conducted on cover crops effect on the land values which will be discussed later in this paper.

Background and Literature Review:

Cover crops have been planted for centuries dating back to the Roman Empire; however as previously stated, their use has increased over the last twenty years. Government organizations such as SARE may be the reason for this increase. Groups such as Sustainable Agriculture Research & Education (SARE) have recommended the addition of cover crops into various crop rotations for various reasons. Some of those reasons include better environmental impact, crop yields, and soil structure. SARE has also released recommendations of different varieties of cover crops based on issues that the farmer may have such as erosion or leaching. Although these organizations are helping in the recommendation of cover crops, they do not account for all planted acres of cover crops.

Furthermore, USDA has not tracked a state average for rye or oats since 1989, and other cover crops have never be tracked. Some farmers have resorted to using leftover wheat as a winter cover. Which leads to the fact that the total of planted acres of cover crops is unknown, but the fact the increase of planting cover crops in recent year has come to a plateau. Reasons for the plateau are not specified, but based on the low margin of row crop farming some researchers are citing the limitation to be the cost of cover crops.

Costs of planting cover crops are driven by the price of the seed as well as planting since those are the highest costs involved. This has caused most producers to lean toward planting rye or leftover wheat. The main problem with either of these varieties is that they may not be the best variety for every farm. For example, if a farm has problems with nitrogen leaching, then a legume cover crop such as clover would be a better potential variety to use in this situation. With the cost being a huge priority, calculating the added value that cover crops bring to a farm is critical in the adoption process. For similar reasons of cost farms with erosion problems often plant cheaper cover crops. Although this does not create as much of a lack of efficiency as the nitrogen leaching farms, the farm could still plant a better crop for the issues at hand.

Issues such as Nitrogen leaching or erosion prevention are long term problems in agricultural land use, and prevention measures need to calculate based on the long run benefits not as a year to year crop. As stated previously, these long-run solutions affect the value of the land based on production benefits and should be taken into consideration when valuing cover crops. Valuing agricultural land has been modeled many times, and each model adds value to the previous models, but using specific models will be important in this study since the model of land values is centered on the relationship of land class and price.

Some previous studies dating back to the 1980s have shown that land values are not correlated with erosion. However, Miranowki and Hammes found statistical significance in variables such as topsoil quality and potential erosion. The study allows the depth of the topsoil and the erosion potential to be tested at various levels to see the effect on land price per acre. Topsoil depth and the erosion potential are directly related to the NRCS land classes and based on the findings from Miranowki and Hammes a similar outcome would be expected.

Similarly, Palmquist and Danielson used farmland sales data to predict the effect of erosion control and drainage in North Carolina using cross-sectional data from various industry professionals. The variables included information related to the land such as soil quality, crop percentage, and tobacco quota. The population density was added in order to control for bigger cities' effect on land values, and a variable to control for future agricultural productivity was also added. The study uses a dummy variable for soil wetness which in turn resulted in a 25 % reduction in land value if the soil was considered wet. Most importantly the study found that a $3.06 increase was expected if soil erosion potential was decreased by one unit on the average parcel. Other variables such as soil quality and tobacco quota were found to be significant as well. The study concluded that soil erosion was not prevented due to the cost of prevention being higher than the production lost. Overall the study was intended to be used as a suggestion of the average benefit of adding drainage to a parcel so the cost of adding drainage could be compared to the long term benefit. However, the studies primary focus was not on soil erosion and did not take cover crops into account as a prevention option.

Palmquist later joined with Roka to conduct a study on using a national database to predict farmland values. Although early on the paper cites that a goal in the study is to estimate characteristics such as soil production and erodibility, which would directly connect to the land classes of this study, other than in the discussion of the data used in the model no erosion value or effect was discussed. The study went on to find that while using a national database had an advantage in that the data was uniform; it lacked in true values since the values in the data set were opinions.

In the mid-2000s, Huang, Miller, Sherrick, and Gomez produced a hedonic model used to estimate farmland values in Illinois. While both previously mentioned papers were used in the Illinois study, the main difference was that Huang, Miller, Sherrick, and Gomez used a spatial lag in their model in order to account for nonagricultural potential in land values. The benefit of using a variable like this would be to control for larger metropolitan areas such as Chicago. This variable would also allow for change over time. The thought process is that as larger cities continue to grow with population and jobs, so will the surrounding areas.

An example of this would be the increase in commuting distance for most major cities over the last few decades (Ingraham, 2017). The increase causes farmland well outside of the city areas to be developed into houses and communities. However, some of these related increases and development potential can be controlled in population density and median income, which will both be tested in the model. The study compared different models but yielded the same results. Farmland values decreased when the number of acres and distance to a major city increased. Productivity characteristics showed a positive effect on land values as expected and included soil productivity. An interesting added variable in the study was swine production. Since swine production is relatively large in Illinois, it could affect land values. The model resulted in an adverse effect on land values regarding the number of swine producers per square mile. The negative reflection in the results could be attributed to the lack of nonagricultural potential in development near swine operations. The impact of this study for Kentucky could be used in poultry production. Based on the results, it would be expected that poultry production would affect land values in Kentucky since it is a major section of agriculture in the state. However, due to lack of data, poultry production will not be assessed in this model.

Land value studies centered on conservation would help in determining the land values in respect to cover crops. Cover crops are considered a conservation practice and farmers already in conversation practices could be a representation of farmers that are more inclined to adopt cover crops. Garr and Taylors studied the influence that the conservation reserve program had on land values over time. The fact that this is a contract based system requiring land to be held for 10 to 15 years allows for the long run value to be assessed. Likewise, cover crops are needed to be treated as a long run investment in order to be implemented. The study found that the program decreased land values by 11% but not across all acres. Garr and Taylor suggested that the variation is a reflection of the land owner's value of a fixed payment and risk level.

Furthermore, since the price is set at the beginning of the contract, there is no account for inflation or market changes in production. Unlike the conservation reserve program, cover crops benefits are expected to increase with consecutive years of practice up to a plateau and then if practice stops a steady decline is expected. Also, farmers are likely to plant cover in higher productive fields instead of low production areas like the conservation reserve program represents. However, researches have suggested that the lower fertile fields are often in more need of a cover crop than the higher fertile fields. Although the results and model do not directly translate into cover crop impact on land value, Garr and Taylor's study helps in the selection of variables such as rent values and farm size.

Data and Method:

The data used in this analysis was obtained from the Kentucky chapter of American Society of Farm Managers & Rural Appraisers. The data consists of annual farm sales from 2005 through 2016 over the entire state of Kentucky. Some variables in the data were the sale price, farm type, sale date, total acres, county, and land classification. (See table one for a complete list of variables) Dummy variables were added to account for farm type and sale date. For sale date both a year and season dummy variable were added. This allowed the model to test for relations between both seasonality and year with the sale price. Multiple dummy variables were added for farm types. When categorizing farms with multiple types of operations, the most significant operation was used. Once the data set was cleaned some variables were added in order to consolidate variables of interest such as farm types. In this process, livestock and cattle farms were placed into a livestock and cattle type. Hobby and recreation farms were also paired together. Land capability classes are represented in the study from class one to class eight. Eight is not included because it is unsuitable for agricultural use. Classes, five through seven were paired together since they represent land that cannot be used for row crops.

Acres squared was added merely by squaring the acres in the dataset. Population density and median income was added to the data and is based on the county that the farm was sold. These two variables are thought to help control for closeness to major cities as pointed out in Huang, Miller, Sherrick, and Gomez's study. Median income will also be used as a control for nonagricultural uses of the land. It can also be important to note that hobby and recreation farm types would be expected to help control for the increase in land values due to psychological utility gained by the buyer. Dummy variables based on USDA state regions was added for comparison. The regions will be used in the understanding of price changes across the state. The importance of using the regions in the regression would be that it helps to incorporate the distance to major cities as well as have a small relationship with production capabilities of the area such as grain elevators or geographical factors that may aid in profitability of the farm. Seasonal and year dummy variables also allow the model to predict how the seasonality of farming effects land values as well as the change in the market from year to year.

During the time of the data, a considerable increase in corn and bean price was seen between 2012 and 2013. The expectation would be that this would cause land values to increase drastically due to higher profit margins and available cash of farmers. Also judging from history farmers tended to think that current status in prices will hold causing them not to consider the long run implication of decisions made. A typical example of this would be the change of pasture land into row crop land. To control for this factor two variables were added to the data. The change in planted acres of soybeans and corn from 2008 to 2013 as well as the change from 2013 to 2016. This allows for the effect of taking acres in and out of crop production to be seen in the model. However, it is much more likely for pasture land to change to crop production rather than crop production into pasture. These changes were shown as a county total and pulled from the USDA quick stats tool.

Within the model crop percentage, a representation of the amount of the farm that is currently being used for row crops was utilized as a variable. This number allows for an estimate of the relationship of the sale price and production level. Crop percentage would also indicate that the higher the number, the higher the per acre cost if row crop production is the highest profit option. Furthermore, this variable potentially could help in controlling for recreational uses and feral land. Based on previous literature suggesting the use of cash rental rates to help in estimating land values, irrigated, non-irrigated, and pasture rental rates were added by county average. These rates were obtained from NASS. It would be expected that higher rental rates would relate to higher land values due to an increase in the productivity of the land.

Model and Expectations:

For this study, an OLS regression was used to find land values by the creation of a hedonic model. A hedonic model allows for different variables to be compared and interpreted in the association with the land value. Furthermore, variables of similar type are compared easily within the hedonic model such as cash rent types or land classes. The model used is stated as:

(1) $Sale\ Price = \beta_0 + \beta_1 Dairy + \beta_2 Hobb_y + \beta_3 RowCrop + \beta_4 Cattle\_Livestock + \beta_5 Tobacco + \beta_6 Equine + \beta_7 Acres + \beta_8 Acre^2 + \beta_9 Pop\_Den + \beta_{10} Med\_Income + \beta_{11} Purchase + \beta_{12} Midwest + \beta_{13} Central + \beta_{14} Northern + \beta_{15} Bluegrass + \beta_{16} EasternMountain + \beta_{17} Y2005 + \beta_{18} Y2008 + \beta_{19} 2009 + \beta_{20} Y2010 + \beta_{21} Y2011 + \beta_{22} Y2012 + \beta_{23} Y2013 + \beta_{24} Y2014 + \beta_{25} Y2015 + \beta_{26} Y2016 + \beta_{27} JanMar + \beta_{28} AprJun + \beta_{29} JulSep + \beta_{30} OctDec + \beta_{31} Crop\% + \beta_{32} IAcres + \beta_{33} IIAcres + \beta_{34} IIIAcres + \beta_{35} IVAcres + \beta_{36} V\_VIIAcres + \beta_{37} NonirrigatedRent + \beta_{38} PasturelandRent + \beta_{39} CropChange0813 +$

β_{40} *CropChange1316* + ε

Where Acre and Acres^2 are the linear and quadratic terms for the size of the entire farm. Dairy, Hobby, RowCrop, Cattle_Livestock, Tobacco, and Equine all refer to the related dummy variable for farm type. Purchase, Midwest, Central, Northern, Bluegrass, and EasternMountain refer to the dummy variable for the region of Kentucky. Y2005, Y2008, Y2009, Y2010, Y2011, Y2012, Y2013, Y2014, Y2015, and Y2016 represent the year dummy variable of when the sale of the farm took place. Likewise, JanMar, AprJun, JulSep, and OctDec represent the season of the year in which the sale took place and are dummy variables. Crop% indicates the amount of land in row crop production. IAvres, IIAcres, IIIAcres, IVAcres, V_VIIAcres represents the number of acres in each land class on that particular farm. NonirrigatedRent and PasturelandRent both refer to the rent value of pasture or non-irrigated land. CropChange0813 and CropChange1316 reference the change in corn and soybean planted acres between 2008 and 2013 as well as 2013 and 2016.

The expectation of a farm type's effect on land value is that equine will have a greater increase in value due to the value of the industry. Hobby farms would also be expected to increase values since these farms are not often worried about profits. Tobacco should have the lowest impact since there is no quota and is not heavily farmed anymore. Acres is expected to show a negative relationship since a higher number of acres results in less available buyers whereas Acres^2 would have the opposite sign. Pop_Den will be positive because land values will be raised by nonagricultural use value. The same can be said of Med_Income. The districts of Kentucky would result in a higher value in the Purchase and Midwest areas due to better topography and production abilities whereas the other areas will be much lower. One expectation would be that the central and bluegrass areas may be higher due to the number of equine farms in the area. The year dummy variables should show a higher coefficient in the years 2012 and 2013 due to the increase in corn and bean price. However, overall a slight increase is expected when year increases due to inflation rates. An increase in value when farms are sold during the winter months is possible. Since farmers often want to see the crops to harvest before selling the land. Acre variables would show a higher coefficient in respects to the lower class numbers. Non-irrigated rent and pasture rent should have a positive correlation since higher rent would imply higher production. Lastly, crop change number would be expected to have a positive relationship due to more acres in row crops. The thought would be that row crops are higher value and moving land into production would yield higher land value. Overall positive coefficients are expected when a variable increase production on the land.

Results:

The coefficient outputs from the model are presented in table 2 along with the standard error and p-value. Fourteen of the forty variables are statistically significant at the ten percent level. Five other variables are not statistically significant at the ten percent level but are relatively close and should be discussed. Overall most of the variables have the expected sign although the coefficient size may not have been expected. Before running the final model, one observation was dropped for the dataset as an outlier. This observation was from 2005 and due to gaps in the data did not fit well in the model.

Reviewing the results from the model the number of acres sold showed a negative relationship with the price per acre. This was expected because more acres resulted in a higher overall sale price limiting the number of buyers. Both Acres and $Acres^2$ were statistically significant at the one percent level. An increase of one acre resulted in an average decrease of $25. Interestingly the farm type showed statistical significance on all types except hobby farms.

This may show that hobby farms are higher priced due to utility gained by the buyer and not profit margins, which is supported by the fact that hobby farms were the closest relation to equine at a $-665 per acre. As expected, all farms are considerably cheaper per acre compared to equine with the most substantial difference being cattle and livestock at a $-3228 per acre. This result may be supported in that throughout the study livestock was a lower profit enterprise based on output prices. On the other end of the spectrum row crops showed a value of $-2337 per acre about equine operations. Much like livestock, this would indicate a higher profit operation compared to other farm types besides equine. Dairy farms were not statistically significant at the ten percent level, but the p-value was close at 0.11. However, upon more investigation, only four dairy farm observations were recorded in the data showing that the data does not represent dairy farms.

District of the state was not statistically significant in all areas. Purchase area was the only significant number at a ten percent level. However, Midwest was close to significance at 0.12. Both of these areas were expected to be significant because both are highly productive areas in Western Kentucky and represent a major portion of row crops in the state. When referenced to the eastern area, the purchase area showed an increase of $1516 per acre. This was higher than any other region, which was expected since it is the highest producing area of the state. It may be important to note that the bluegrass showed a p-value of 0.11 and a coefficient of 651. The higher coefficient could be a reflection of the concentration of equine operations in the bluegrass. However, with no statistical significance that was not explored.

Years in which farms were sold did not show the expected sign. In comparison with 2008, all years estimated a negative coefficient on average. Before running the model, the thought was that as year increase so would price due to inflation and output price increase.

However, as stated that is not the case. Years 2010, 2013, and 2014 were the only statistically significant years, interestingly enough those years also showed the largest negative coefficients. 2010 was the most negative at -$1558 per acre, followed by 2013 at -$1382, and 2014 at -$1321. Although it was not significant, 2016 should the most positive relationship with a -$122 per acre. One possible reason for all negative coefficients could be the decrease in land values from the market bubble crash of 2008. Seasonality was not statistically significant at any level. However, a farm sold in the fall and winter months showed a lower estimated value. This can be attributed to the lack of production possibilities and feral ground during the winter months.

Land classes five through seven were separated in order to have a better representation of the value. Statistical significance was not affected when changed. Land classes were not as significant as hoped. Only classes one and two were significant, whereas all other classes were not even close when comparing to class seven. The estimation showed a $33 increase per acre with class one acres and a $16 increase with class two acres, as expected due to the high productivity of these acres. All other classes except class four showed a positive coefficient in reference to class seven. Class four is an unexpected result but is not significant, which could be a result of the data used in the model.

Rental rates for land was not statistically significant. This is most likely due to the lack of observations in the reference group, although results were not expected due to the rates being county averages and not individual to each farm sale. Crop percent was highly related to price per acre at a one percent level. This was expected since crop percentage represents the amount of land in crop production. Correlation between crop percent and row crops farm type was tested and show a 24% level. Therefore, crop percent should be accounted for in the model.

Furthermore, crop change in planted acres was significant for 2013 to 2016 with a coefficient of -$.13. The interpretation would be that one more acre planted in corn or beans would yield a -13 cent increase in price per acre. This number is relatively small because the data shows a county average of planted acres, not a farm level, which means that farms not in crop production water down the effect of the planted acre increase. The reason for the negative coefficient is related to the output price. When the price of corn and beans dropped after 2013, lower production soils were not able to be marginally profitable. However, due to the infrastructure land that was moved from livestock to row crops previously was not able to move back to livestock. The coefficient was expected to be lower than the -.13, but higher prices in the cattle market during 2015 probably aided in the prevention of loss of these acres.

Overall the model shows many variables that are significant, but some shortcomings were found in the modeling process. Lack of cover crop data on the farms in the dataset causes the relationship of cover crops and land values not to be directly estimated. Also, land classifications lack slope or erosion number caused for assumptions to be made in using classes as an indicator of erosion. Farm sales before 2008 would be an excellent comparison to effectively state that the market crash was the reason for the negative coefficients with year dummy variables. Furthermore, no water data was presented in the study, nor was there any model estimating individual counties effect on sale price. These two would have gone together seeing that county could help control for water availability.

Conclusion:

Prior studies have used national and state database to estimate land values, as well as numerous hedonic models, though none have looked at cover crop impact on these values. Due to a limitation in available data cover crops were not directly shown to impact land values.

However, the estimation of land capability classification was predicted and shown as a positive relationship for the state of Kentucky. The results of this study would suggest that if cover crops can maintain or increase land classification by increasing organic matter or preventing soil erosion, then some of the cost of planting cover crops can be recovered in the land sale value.

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Table 1. Summary of Variables

Table 1					
Variable Name	Definition	Mean	Standard Deviation	Min	max
Dairy	Dummy Variable for Dairy Farm	0.005	0.070	0	1
Equine	Dummy Variable for Equine Farm	0.066	0.249	0	1
Hobby	Dummy Variable for Hobby Farm	0.058	0.233	0	1
Row Crop	Row Crop	0.211	0.408	0	1
Cattle_Livestock	Dummy Variable for Cattle and Livestock Farm	0.644	0.479	0	1
Tobacco	Dummy Variable for Tobacco Farm	0.016	0.125	0	1
Acres	Total Acres	102.191	83.114	2	660
Acres_Squ	Total Acres Squared	17321.280	36723.300	0	435033
Pop_Den	Population Density	45815.030	73076.110	2239	304473
Med_Income	Median Income	39856.020	6993.784	21883	61839
Purchase	Purchase District	0.015	0.121	0	1
Midwest	Midwest District	0.064	0.245	0	1
Central	Central District	0.267	0.442	0	1
Northern	Northern District	0.100	0.300	0	1
Bluegrass	Bluegrass District	0.469	0.499	0	1
Eastern or Mountain	Eastern or Mountain District	0.086	0.281	0	1
Y2008	Dummy variable for 2008	0.028	0.166	0	1
Y2009	Dummy variable for 2009	0.071	0.257	0	1
Y2010	Dummy variable for 2010	0.129	0.335	0	1
Y2011	Dummy variable for 2011	0.097	0.296	0	1
Y2012	Dummy variable for 2012	0.069	0.253	0	1
Y2013	Dummy variable for 2013	0.146	0.354	0	1
Y2014	Dummy variable for 2014	0.235	0.424	0	1
Y2015	Dummy variable for 2015	0.168	0.374	0	1
Y2016	Dummy variable for 2016	0.057	0.231	0	1
Jan-Mar	Dummy variable for quarter one	0.253	0.435	0	1
Apr-Jun	Dummy variable for quarter two	0.297	0.457	0	1
Jul-Sep	Dummy variable for quarter three	0.232	0.423	0	1
Oct-Dec	Dummy variable for quarter four	0.217	0.413	0	1

Land_Price_Per_acre	Price Per Acre	4079.161	4283.373	209	45556
Crop %	Percent of land in crop production	58.506	28.918	0	98
Land Class I Acres	Acres of class 1	0.890	5.368	0	78
$/I	Price of class one 1	4749.590	4471.722	235	42287
II Acres	Acres of class 2	28.298	37.092	0	325
$/II	Price of class one 2	4741.601	4469.083	325	42287
III Acres	Acres of class 3	23.432	27.930	0	267
$/III	Price of class one 3	4333.130	4140.870	260	42287
IV Acres	Acres of class 4	9.307	17.049	0	160
$/IV	Price of class one 4	3924.317	3858.533	0	42287
V Acres	Acres of class 5	0.768	4.803	0	68
$/V	Price of class one 5	3713.783	4519.619	0	82629
VI Acres	Acres of class 6	9.216	20.589	0	218
$/VI	Price of class one 6	3400.194	3372.175	0	42287
VII Acres	Acres of class 7	4.779	14.558	0	147
$/VII	Price of class one 7	3228.015	3596.736	0	52157
Non-Irrigated Rent	Non irrigated land rent	64.866	52.121	0	225
Pastureland Rent	Pasture land rent	19.039	12.894	0	48
Irrigated Rent	Irrigated land rent	117.349	112.196	0	350
CropChange08-13	Change in planted acres of corn and soybeans from 2008 to 2013	7020.867	5086.787	-200	22050
CropChange13-16	Change in planted acres of corn and soybeans from 2008 to 2014	819.323	2454.607	-3200	11100

Table 2 Results

Table 2			
	Coefficient	Standard Error	P Value
Dairy	-2266.30	1434.51	0.12
Hobby	-665.65	611.16	0.28
RowCrop	-2337.93	569.27	0.00
Cattle_Livestock	-3228.74	517.01	0.00
Tobacco	-2784.56	879.35	0.00
Acres	-25.15	4.00	0.00
Acres_Squ	0.03	0.01	0.00
Pop_Den	0.03	0.00	0.00
Med_Income	0.01	0.02	0.47
Purchase	1516.93	866.32	0.08
Midwest	1070.38	699.63	0.13
Central	2.29	460.02	1.00
Northern	583.81	513.63	0.26
Bluegrass	651.19	412.42	0.12
Y2009	-943.96	784.42	0.23
Y2010	-1558.29	720.95	0.03
Y2011	-1152.90	758.84	0.13
Y2012	-1217.61	779.25	0.12
Y2013	-1382.94	766.98	0.07
Y2014	-1321.48	743.84	0.08
Y2015	-291.76	613.08	0.63
Y2016	-122.64	705.09	0.86
JanMar	225.32	280.65	0.42
AprJun	257.84	272.14	0.34
JulSep	22.44	283.10	0.94
Crop	24.08	5.39	0.00
LandClassIAcres	33.23	18.51	0.07
IIAcres	16.20	4.85	0.00
IIIAcres	7.69	5.89	0.19
IVAcres	-5.49	7.17	0.44
VAcres	22.50	20.17	0.27
VIAcres	6.90	5.58	0.22
NonIrrigatedRent	5.16	4.49	0.25
PasturelandRent	17.18	21.15	0.42
CropChange0813	-0.01	0.02	0.81
CropChange1316	-0.14	0.06	0.02