Cropland and Pasture Land Values in the Great Plains

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Introduction

Producers, landowners, lenders, appraisers, and others in agribusiness regularly request information pertaining to land values and cash rents at the county level (and even more localized levels in some cases). This information is important to these individuals for a variety of reasons, including understanding the relative profitability of agricultural land.

To explain land values, it is necessary to consider the factors that contribute to the variation in land values. One of these factors is the productivity of the land.
While there are numerous ways to consider the productivity of land (e.g., yield potential, soil type, and land classification), cash rent is probably one of the better proxies for land. Cash rent accounts for both physical productivity and the costs associated with achieving that productivity. Additionally, cash rental rates reflect the demand for farmland in a certain area. Another factor impacting land values is proximity to urban areas. Growing populations and urban sprawl can dramatically affect agricultural land values in surrounding areas. The mix of land cover in a county (woodland, water, etc.) may also affect agricultural land values if there is a strong demand for recreational use. There may also be a difference in land values between states, all else equal, simply due to different property tax or political structures.

The objective of this paper is to analyze the factors that contribute to non-irrigated cropland and pasture land values in Kansas and portions of surrounding states, thereby facilitating a better understanding of the agricultural land market in this region.

Literature Review

Several approaches have been used to analyze the determinants of land prices, including structural, hedonic, and time-series models. This paper will focus on the hedonic model, which uses land characteristics to explain the variation in land prices observed in the market.

The dominant approach to modeling land valuation assumes that land values are determined by the discounted net present value of net incomes (or land rents) which are expected to be received over time from land assets (Alston; Burt). This approach of using discounted future returns is often referred to as the "maximum bid model" as it calculates the maximum price a buyer can pay given expectations of future returns, interest rates, tax rates, and other factors. The discounted net present value approach has been discussed several times at this conference (Kastens and Dhuyvetter in 2002 and Dhuyvetter in 1996).

Hedonic models have been used to expand the discounted net present value approach to determine the effects of various land characteristics and other heterogeneous factors of production on land prices. Palmquist considered the rental price of land as a function of land characteristics. Torrell, Libbin, and Miller used land sales prices as the dependent variable and attempted to quantify the differences in non-irrigated and irrigated farmland prices in the U.S. Ogallala Aquifer region.

Other land valuation studies have used hedonic models to determine the impacts of agricultural production, average farm size, population, and urbanization on farmland prices (Sandry, et al.). Gardner and Barrows considered parcel characteristics, including proportion in cropland, pasture, and forest, soil type, and location to determine the impact of soil conservation investments on land prices. Nivens et al. included satellite imagery as a proxy for productivity along with numerous other factors in a hedonic framework to predict Kansas land values. While the hedonic model has been used extensively in analyzing land prices, it has generally relied upon individual tracts of land. However, this analysis focuses on county-level land prices as opposed to individual tracts of land.

Theoretical Model

A hedonic model is used to consider the impacts of various land characteristics and demographic factors on land prices for non-irrigated cropland and pasture land at the county level. The models consider the influence of cash rents, land cover, population, and location, and are specified as follows:

$$(1)\quad PLand_c = f(Cash\ Rents_c,\ Popden,\ Popden^2,\ Urban\ Location,\ Percent\ CRP,\ Percent\ Woodland,\ Percent\ Water,\ State_i\ ),$$

$$(2)\quad PLand_p = f(Cash\ Rents_p,\ Popden,\ Popden^2,\ Urban\ Location,\ Percent\ CRP,\ Percent\ Woodland,\ Percent\ Water,\ State_i\ ),$$

where $PLand_c$ is the average per acre price of non-irrigated cropland and $PLand_p$ is the average per acre price of pasture at the county level. $Cash\ Rents_c$ and $Cash\ Rents_p$ are the average rental rate in dollars per acre for non-irrigated cropland and pasture land, respectively, evaluated at the county level. *Popden* is the population density of each county and $Popden^2$ is the square of *Popden*. *Urban Location* is an index assigned to each county that weights the relative proximity to various metropolitan areas. *Percent CRP, Percent Woodland,* and *Percent Water* describe the percent of each county's land base that is enrolled in the Conservation Reserve Program (CRP), that is woodland, or that is water bodies, respectively. $State_i$ is a binary variable identifying the state in which each county is located: Colorado, Kansas, Missouri, Nebraska, or Oklahoma.

The net income to farmland is expressed as the average cash rents to non-irrigated cropland or pasture land (*Cash Rents*) and represents the agricultural income generating capacity of the farmland. The discounted present value of net income is expected to be bid into land prices. Therefore, a positive relationship between cash rents and land values is expected. That is, land with higher average cash rents is expected to have a higher value.

Urban growth is expected to increase land values. The presence of more bidders as well as alternative uses (residential, commercial, industrial, and recreational) may increase the value of surrounding agricultural land. The population density variables (*Popden*, $Popden^2$) and the urban index variable (*Urban Location*) are expected to have a positive relationship with both non-irrigated cropland and pasture land values. The squared population density variable ($Popden^2$) is included to allow the impact of population within a county to be nonlinear. While the *Popden* variable is included to account for "urban sprawl" and the local demand for land, the *Urban Location* variable is included to account for the potential demand for land for non-agricultural purposes such as hunting.

Land cover may have an influence on land values with respect to alternative uses such as recreation or hunting. The land cover variables (*Percent CRP, Percent Woodland, Percent Water*) are expected to have a positive relationship with land values that reflects alternative valuation of agricultural land for hunting, fishing, camping, and other outdoor uses.

Location of a county within a specific state may impact land values due to differences in property tax rates or other political structures. The binary variable for each state ($State_i$) will represent a discount or premium for land values relative to identical non-irrigated cropland or pasture land in Kansas (Kansas is used as the base state and thus all other states are "relative to Kansas" in the analysis). If property tax rates are the dominant difference between states, the expected sign will reflect the relative tax structure (Kastens and Dhuyvetter). If other structural differences are present, the expected sign will ultimately be an empirical issue.

Data

Table 1 presents descriptions of the variables used in the empirical model and summary statistics for each variable. County-level land value and cash rent data are not currently publicly reported for Kansas or the surrounding states. However, these data are reported at the Crop Reporting District (CRD) level by USDA/NASS for Kansas, Missouri, and Nebraska. USDA publishes a state level land value and cash rent for farm land in Colorado. Oklahoma land values and cash rents are published by Oklahoma State University (OSU). Land values and cash rents were calculated for 105 counties in Kansas, 14 counties in Colorado, 28 counties in Missouri, 26 counties in Nebraska, and 23 counties in Oklahoma. The calculated land values and cash rents for each county are presented in Figures 1 and 2, respectively, for non-irrigated cropland. Similarly, land values and rents for pasture are presented in Figures 3 and 4.

In order to obtain a county-level value ($PLand_c$, $PLand_p$, $Cash\ Rents_c$, $Cash\ Rents_p$) for each state, CRD level data were prorated to the county level. Prorating of CRD level values to the county level required several pieces of information in addition to the CRD level values. First, some measure of county-to-county variation is required, and second, a measure of acres in each county is needed. Information gathered from 2000 to 2002 on county level cash rents and land values from the Farm Service Agency (FSA) was used to index county-to-county variation.[1] After county indices were calculated, they were weighted to reflect the acres of non-irrigated cropland or pasture in that particular county relative to the CRD as a whole. The acreage weights were based on acres reported for each county in the 1997 Census of Agriculture (USDA). The acreage-weighted indices were then multiplied by the CRD averages to arrive at the county level values shown. Thus, the county-level values, when multiplied by the respective acreage-based weights and summed, will exactly equal the USDA (or OSU) reported values at the CRD level (Dhuyvetter, et al.).

This methodology could not be employed with the Colorado data because CRD level data were unavailable. Instead, the data provided by FSA for 2002 were used, without indexing the land values to reflect USDA/NASS estimates.

Population density data were collected for each county from the 2000 Population Census. It is measured as people per square mile at the county level.

Urban Location is an index assigned to each county that is based on a combination of relative geographical location and populations of urban centers in each of the five states included in this study. The urban centers used in this index met the criteria of being located within the five states studied and each city's Metropolitan Statistical Area (MSA) must be greater than 500,000 people according to the 2000 Population Census. The MSA's included in the index are: Denver, CO, Colorado Springs, CO, Oklahoma City, OK, Tulsa, OK, Wichita, KS, Omaha, NE, Kansas City, MO, and St. Louis, MO. Figure 5 shows the locations of each MSA relative to the region of counties studied.

Geographical locations for the counties and MSA's were determined by the latitude and longitude of the centroid (i.e., the geographical center) of each location. The Haversine Formula was used to calculate the distance between the centroid of each county and the centroid of each MSA (Sinnott). The population of each MSA was also included in the index to account for size differences between each metropolitan area. The formula for inverse distance was used to calculate the *Urban Location* index. The formula is as follows:

(3) $$UL_j = \frac{\sum_{i=1}^{n}\left[V_i * \frac{1}{d_i^K}\right]}{\sum_{i=1}^{n}\left[\frac{1}{d_i^K}\right]},$$

where UL_j is the *Urban Location* index calculated for county j, V_i is the population of MSA_i, d_i^K is the distance of county j to MSA_i, and K=1. The index is designed to account for possible urban influence in a county, weighted by the relative size and

[1] Because FSA data are not survey-based, they were used to create county indices for cash rents and land values rather than using the reported values directly.

location of each urban area. Therefore, a county in northwest Kansas will have a high geographical value relative to Denver, but a low geographical value relative to Kansas City. However, that same county may be equally distant from Denver as from Wichita and the relative weight for Denver will be higher because the population of the Denver MSA is approximately five times larger than the Wichita MSA. The overall index value will be highest for counties that are close to more than one of the urban areas, weighted by relative population of the urban areas.

Land cover data for land classified as CRP and woodland were collected from the 1997 Census of Agriculture and land cover data for water were collected from the 2000 Population Census. The total number of acres of CRP land was divided by the total amount of agricultural land plus the land classified as urban and water by the 2000 Population Census to calculate *Percent CRP*. *Percent Woodland* and *Percent Water* were calculated in a similar manner.

Empirical Results

Equations (1) and (2) were estimated using Ordinary Least Squares (OLS). The land value and cash rent data are cross-sectional observations from 196 counties in Colorado, Kansas, Missouri, Nebraska, and Oklahoma for 2002. Land values for non-irrigated cropland are estimated by Model (1) and land values for pasture land are estimated by Model (2).

Non-Irrigated Cropland Values

Parameter estimates of Model (1) are presented in Table 2 and indicate that $Cash\ Rents_c$ are statistically significant at the 99% (p-value = 0.01) level and positively impact the value of non-irrigated cropland.[2] Thus, a $1/acre increase in the rental rate will increase non-irrigated cropland values by $10.36/acre. The elasticity of this coefficient is E = 0.52, evaluated at the mean of the variables. This elasticity value implies that a one percent increase in cash rent is expected to increase land values 0.52 percent. The positive relationship of cash rents to land values was expected in the theoretical model due to the capitalization of rents into land values over time. The fact that cash rents do not impact land values one-for-one (i.e., the elasticity is less than one) is indicative of the other factors influencing land values, including non-agricultural factors and risk. That is, if land values were only influenced by agricultural uses, and if current cash rents are good indicators of expected cash rents, then we would expect that a one percent increase in cash rent would be associated with a one percent increase in land value.

[2] Statistically significant at the 99% level means that we are 99% confident that the coefficient is not equal to 0, and thus we have a high level of confidence that this variable impacts land values. The level of confidence is equal to (1- α), where α = the p-value reported in Tables 2 and 3. Note, for discussion purposes, p-values are often "rounded up" to values such as 1%, 5%, 10%, etc. rather than mentioning the actual p-value. For example, the p-value for $Cash\ Rent_c$ is less than 1%, indicating our confidence level is actually greater than 99%.

Popden is statistically significant at the 99% level and $Popden^2$ is not statistically significant. The positive sign on the *Popden* coefficient indicates that an increase of one person per square mile increases non-irrigated cropland \$3.02/acre. The elasticity of *Popden* is $E = 0.19$, evaluated at the mean of *Popden*, $Popden^2$, and $Pland_c$. The expected negative sign of the coefficient of $Popden^2$ would indicate that the effect of population density on land values is increasing at a decreasing rate. That is, the positive effect on land values decreases as the population density grows and the largest effect would be seen at low levels of population density. In this case, population density is positively related to pasture land values, but not necessarily at a decreasing rate ($Popden^2$ is negative, but we have little statistical confidence that it is different from 0).

The *Urban Location* coefficient is statistically significant at the 99% level and is positively related to land values. An elasticity value of $E = 0.55$ indicates a 1 percent increase in the index will increase land values by 0.55 percent, evaluated at the mean of the variables. Interpretation of this coefficient can be illustrated using an example of two Kansas counties, Thomas and Ford. The *Urban Location* value for Thomas County is 1,166,681, while the *Urban Location* value for Ford County is 1,071,646. Along with the coefficient estimate, this indicates a difference of \$38.01 per acre in land values, with Thomas County being higher. However, the other variables in the model must be considered when comparing the two counties. Cash rents are higher for Thomas County, indicating higher land values than Ford County. Another factor that increases the land values of Thomas County relative to Ford County is the larger percentage of woodland in Thomas County. There is also a larger percentage of CRP in Ford County, but this variable is shown later to have a negative relationship with land values and again increases land values in Thomas County relative to Ford County. Finally, the population density of Ford County is 28.5 people per square mile, while Thomas County has approximately 7.6 people per square mile. The positive relationship of population density to land values will mean Thomas County land values are expected to be lower than Ford County based on this factor. The relative magnitude of each variable sums to a higher land value in Thomas County, according to the model. This is consistent with an observed difference of \$122.21 per acre in non-irrigated cropland values between the two counties, with Thomas having the higher land values.

The land cover variables *Percent CRP* and *Percent Woodland* are statistically significant at the 99% level. *Percent Water* is not statistically significant. The expected sign of *Percent CRP* was positive, however, the coefficient in the model is negative. This variable may be indicating average land quality rather than premiums from hunting or other recreational activities. The data used to calculate this variable are based on survey questions that ask landowners and producers to evaluate all the land they own/operate. If lower quality land (i.e., highly erodible) is included in the average land value of all land owned/operated, then the average land value would decline as the percent of land in CRP increased. Interpretation of the coefficient of *Percent CRP* indicates a one percent increase in the amount of CRP land in a county will decrease the average county land value by \$16.76/acre for non-irrigated cropland, holding all else equal.

The coefficient of *Percent Woodland* is positive and indicates a one percent increase in the amount of woodland in a county will increase county-level average land values by $23.15/acre. The positive relationship between *Percent Woodland* and land values was expected, but can be explained by several possible effects. One of the effects may be the impact of the additional value of woodland for recreational purposes (i.e., hunting, camping, or hiking). The coefficient may indicate that the potential revenue from harvesting trees has a positive impact on non-irrigated cropland values. Another explanation of the positive relationship includes a relative scarcity of cropland in highly wooded areas, resulting in greater demand for the cropland that is present and thus increasing land values. There may also be an effect that is captured by the data, where woodland is essentially considered to be worth zero, so the total price paid for land is reflected in cropland value (i.e., the total acres that are valued is less than the total acres purchased, so the per acre cropland value is higher).

The coefficients of the *State* dummy variables are statistically significant for Colorado at the 90% level and not statistically significant for Missouri, Oklahoma, and Nebraska. The coefficients of these variables are interpreted as premiums or discounts to identical non-irrigated cropland in Kansas. The coefficient for Colorado indicates a $127/acre discount for land in Colorado when compared to identical land in Kansas. The property tax rates in Colorado are lower as a percent of land value, compared to Kansas (Kastens and Dhuyvetter) and thus it would be expected that land values would be higher in Colorado, holding all other factors equal. The negative relationship shown in the model was not expected and this suggests that the $State_i$ variable is measuring some other regional effect. These regional effects need to be further explored in future research to determine state to state differences.

Pasture Land Values

Model (2) estimated the impacts of various land characteristics and demographic variables on pasture land values and the parameter estimates are presented in Table 3. The model indicates $Cash\ Rents_p$ are statistically significant at the 99% (p-value = 0.01) level and there is a positive relationship between rental rates and pasture land values. The coefficient indicates that a $1/acre increase in pasture rental rates increases pasture land values $20.59/acre. The elasticity of this coefficient is $E = 0.53$, evaluated at the mean of the variables. The positive effect of rental rates on pasture land values is due to the capitalization of rents into land values over time, similar to the effect of rental rates on non-irrigated cropland. Likewise, the elasticity value less than one indicates that other factors, including non-agricultural factors, must be influencing pasture values.

The coefficient of *Popden* is statistically significant at the 99% level, while the coefficient of $Popden^2$ is not statistically significant. In this case, population density is positively related to pasture land values, but not necessarily at a decreasing rate ($Popden^2$ is negative, but we have little statistical confidence that it is different from 0). The effect of an increase in population density of one person per square mile results in an increase in pasture land value of $2.31/acre. The elasticity of the coefficient is $E = 0.20$, evaluated at the mean.

The *Urban Location* coefficient is statistically significant at the 99% level and indicates a positive relationship between geographic proximity to urban areas and pasture land values. The elasticity is *E* = 1.04, evaluated at the mean, and indicates that a one percent increase in the urban index will increase pasture land values by 1.04 percent. Again, interpretation of this coefficient may be illustrated with an example of two Kansas counties. In this example, the two counties compared are Woodson and Jewell. The *Urban Location* value for Woodson County is 1,091,180, while the *Urban Location* value for Jewell County is 1,024,266. This indicates a difference of $37.05 per acre in land values, with Woodson County being higher. As with the cropland model, the other variables in the pasture model must be considered when making comparisons between the two counties. Cash rents are higher for Woodson County, indicating higher land values than Jewell County. Another factor that increases the land values of Woodson County is the larger percentage of woodland within the county. There is a larger percentage of CRP in Jewell County, thereby decreasing the pasture land values of Jewell County relative to Woodson County. Finally, the population density of Woodson County is 7.6 people per square mile, while Jewell County has approximately 4.2 people per square mile. The positive relationship of population density to land values will decrease relative land values in Jewell County. The relative magnitude of each variable sums to a higher land value in Woodson County, according to the model. This is consistent with an observed difference of $114.97 per acre in non-irrigated cropland values between the two counties, with Woodson having the higher pasture land values.

The land cover variables *Percent CRP* and *Percent Woodland* are statistically significant at the 90% and 99% levels, respectively. *Percent Water* is not statistically significant. The coefficient of *Percent CRP* indicates a negative relationship between the percent of land in CRP in a county and pasture land values. The reasoning behind this relationship is similar to the relationship with non-irrigated cropland in that the variable may be describing the amount of highly erodible, low-valued land in a county rather than recreational value. A one percent increase in the percent of CRP will decrease pasture land values by $10.78 per acre. The coefficient of *Percent Woodland* also has a positive relationship with pasture land values that is similar to the effect on non-irrigated land values. In this case, a one percent increase in the percent of woodland in a county will increase county level pasture land values by $19.87 per acre.

The coefficients of the *State* dummy variables are statistically significant for Oklahoma at the 99% level and not statistically significant for Missouri, Nebraska, or Colorado. The Oklahoma *State* coefficient indicates a premium for Oklahoma pasture land of $233/acre over identical Kansas pasture land. This effect is partially explained by the lower property tax rate as a percent of value for Oklahoma as compared to Kansas. As mentioned previously, other regional effects are likely being measured by this variable besides the property tax structure as this discount is unexpected given the relative property taxes of Colorado and Kansas.

Implications

The models presented in this paper quantify the effects various land characteristics and demographic variables have on non-irrigated cropland and pasture land values. The R^2 values reported in Tables 2 and 3 indicate that the variables included in the analysis explained 84% and 79% of the variation in land values for non-irrigated cropland and pasture, respectively. Both models considered cash rents because it is expected that returns to land will be capitalized into land values over time. The results support this theory by indicating a positive relationship between cash rents and land values for both non-irrigated cropland and pasture. However, cash rent elasticities less than one indicate that land values are impacted by factors other than current land productivity.

In addition to cash rents, there are other factors that affect land values. These include population density and geographical proximity to urban areas. The results of both models indicate there is a positive impact on land values as population density increases (i.e., the "urban sprawl" effect). There is also a positive impact on land values if a county is located relatively close to a major metropolitan area. While the distance to a metropolitan area variable may be measuring the urban sprawl effect somewhat, the coefficient is likely capturing the effect of non-agricultural demands for the land. For example, people from Denver and Colorado Springs, Colorado, who hunt in western Kansas, may be impacting land values. This could be a result of fee hunting, which adds to the revenue per acre of agricultural land, but which is unaccounted for in agricultural rents. The other possibility is that hunters may be purchasing land directly for hunting rather than contracting with a landowner or guide for fee hunting, which means land values may be "bid up" relative to their agricultural values.

Land cover classifications for CRP and woodland have opposite effects on land values. The positive relationship of percent of woodland in a county to non-irrigated cropland and pasture land values supports the idea of higher valued recreational usage. The percent of CRP, however, probably indicates a relative measure of county-wide land quality.

There are differences between states in both property taxes and political structures. The results of the models indicate these regional differences exist, but do not fully explain the variation.

Conclusion

Agricultural land values provide important information to producers, landowners, lenders, appraisers, and investors. They provide a relative measure of productivity and non-agricultural demand. Often, it is difficult to understand why certain parcels of ground sell for different prices when they are similar in many ways. To explain the variation in county land values, it is useful to characterize the differences in land between counties. Once these contributing factors are identified, it is possible to quantify the value of each characteristic and more fully understand the market for land.

One aspect of the Kansas agricultural land market is the influence of non-agricultural factors. These include population and recreational uses for cropland and pasture. There is no direct measure of these impacts, but proxies can be used to help understand the relationship and the relative magnitudes of these factors. This study shows there is some impact on land values from non-agricultural uses and begins to identify some of the specific factors. Further research will explore these factors further and provide a more detailed view of the agricultural land market in Kansas.

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Table 1. Variable Descriptions and Summary Statistics

Variable Name	Description	Total Sample Size n = 196			
		Mean	Standard Deviation	Minimum Value	Maximum Value
$PLand_c$	Average county land value for non-irrigated cropland, $/acre.	820.04	566.40	125.00	4,154.30
$PLand_p$	Average county land value for pasture, $/acre.	596.30	545.20	100	4,019.10
$Cash\ Rents_c$	Average county cash rental rate for non-irrigated cropland, $/acre.	41.30	19.14	14.00	111.59
$Cash\ Rents_p$	Average county cash rental rate for pasture, $/acre.	15.30	6.89	3.00	32.84
Popden	Population density of a county measured in people per square mile.	51.75	152.66	0.90	1,082.70
Urban Location	Index of relative geographical proximity of a county to an urban area, weighted by population of the urban area.	1,121,107	158,384	652,841	1,702,727
Percent CRP	Percentage of land in county enrolled in the Conservation Reserve Program (CRP).	4.6	3.5	0.2	18.2
Percent Woodland	Percentage of land in county classified as woodland.	2.7	3.8	0.0	28.1
Percent Water	Percentage of land in county classified at a water body.	1.0	1.5	0.0	8.9
Colorado	Binary variable for state in which county is located.	0.071	0.258	0	1
Kansas	Binary variable for state in which county is located.	0.536	0.500	0	1
Nebraska	Binary variable for state in which county is located.	0.133	0.340	0	1
Missouri	Binary variable for state in which county is located.	0.143	0.351	0	1
Oklahoma	Binary variable for state in which county is located.	0.117	0.323	0	1

Table 2. Hedonic Model Regression Results: Model (1) Non-Irrigated Cropland

Variables*	**Parameter Estimates/Statistics**	**Standard Errors**	**t-statistics**	**p-values**
Constant	-176.05	156.94	-1.12	0.263
Cash $Rents_c$	10.36	1.23	8.42	0.000
Popden	3.02	0.44	6.84	0.000
$Popden^2$	-0.0007	0.0004	-1.57	0.119
Urban Location	0.0004	0.0001	3.14	0.002
Percent CRP	-16.76	5.61	-2.99	0.003
Percent Woodland	23.15	6.77	3.42	0.001
Percent Water	-21.10	13.79	-1.53	0.128
Colorado	-127.20	72.84	-1.75	0.082
Nebraska	-44.33	59.69	-0.74	0.459
Missouri	118.67	78.53	1.51	0.132
Oklahoma	-3.76	59.18	-0.06	0.949
R^2	0.8382			
RMSE	234.51			
Number of Observations	196			

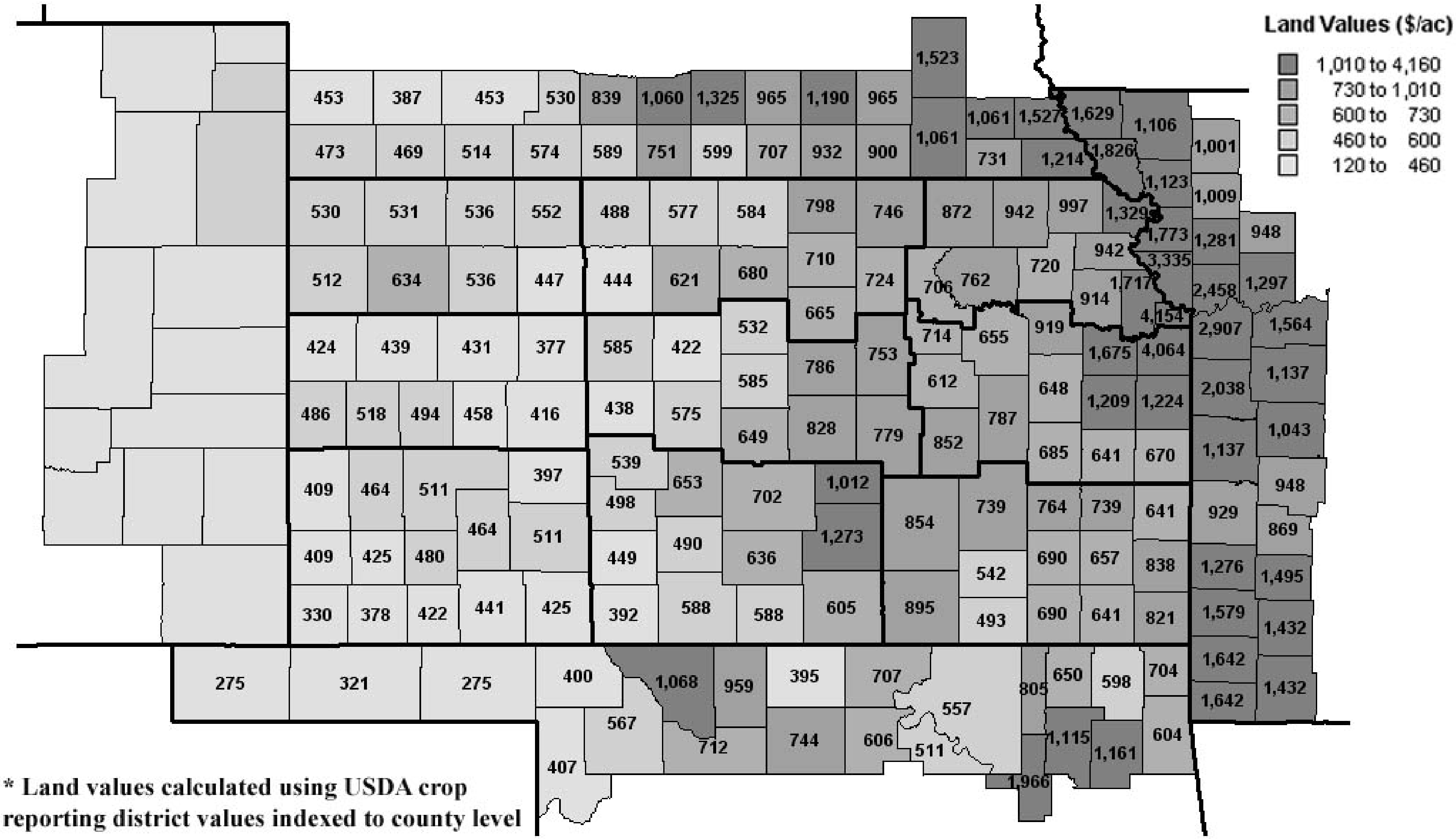
**Kansas* is the omitted state dummy variable, R^2 is the R-squared term, RMSE is the root mean squared error, and Number of Observations is the total observations used in the model.

Table 3. Hedonic Model Regression Results: Model (2) Pasture

Variables*	**Parameter Estimates/Statistics**	**Standard Errors**	**t-statistics**	**p-values**
Constant	-482.66	176.35	-2.74	0.007
Cash Rents$_p$	20.59	4.72	4.36	0.000
Popden	2.31	0.48	4.79	0.000
Popden^2	-0.00002	0.0005	-0.05	0.962
Urban Location	0.0006	0.0001	3.85	0.000
Percent CRP	-10.78	6.16	-1.75	0.082
Percent Woodland	19.87	7.45	2.67	0.008
Percent Water	-3.42	15.10	-0.23	0.821
Colorado	-129.19	80.90	-1.60	0.112
Nebraska	-3.88	68.59	-0.057	0.955
Missouri	41.85	91.01	0.460	0.646
Oklahoma	233.37	66.30	3.52	0.001
R^2	0.7915			
RMSE	256.29			
Number of Observations	196			

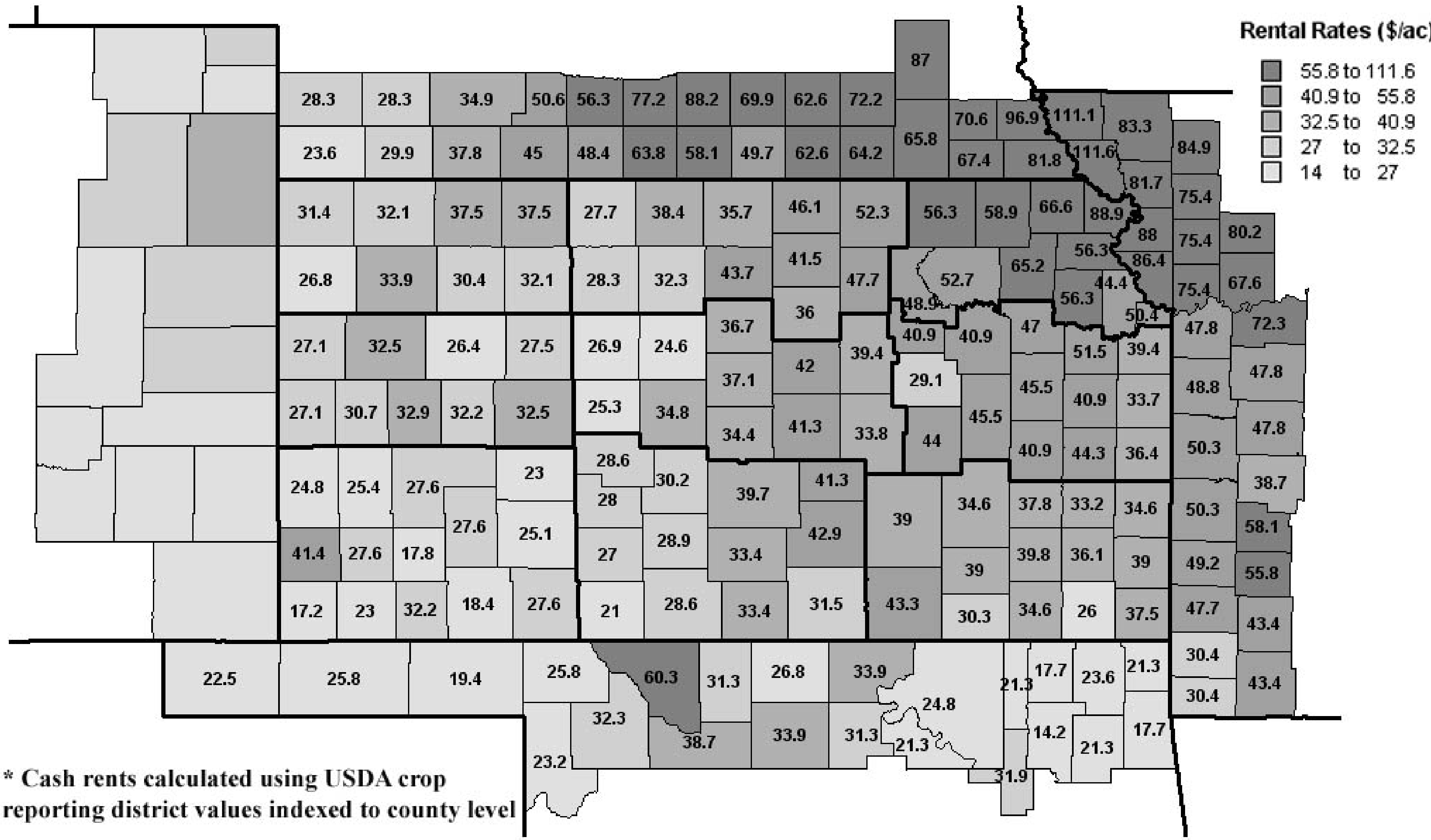
**Kansas* is the omitted state dummy variable, R^2 is the R-squared term, RMSE is the root mean squared error, and Number of Observations is the total observations used in the model.

Figure 1. Non-Irrigated Cropland Values*



*** Land values calculated using USDA crop reporting district values indexed to county level**

Figure 2. Non-Irrigated Cropland Cash Rents*



* Cash rents calculated using USDA crop reporting district values indexed to county level

Kansas Land Values and Cash Rents at the County Level

March, 2003
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Producers, landowners, lenders, appraisers, and others in agribusiness regularly request information pertaining to land values and cash rents at the county level (and even more localized levels in some cases). However, there currently are no publicly reported price data at this level available for Kansas. As part of USDA, Kansas Agricultural Statistics (KAS) conducts a land survey each year and reports land values and cash rents at the crop reporting district (CRD) level in Kansas. Table 1 shows the 2002 CRD level land values and cash rents for both non-irrigated cropland and pasture as reported by KAS.

Table 1. Kansas Crop Reporting District Level Agricultural Land Values and Cash Rents.[a]

	Non-irrigated Cropland		Pasture	
Region (CRD)	Value, $/ac	Rent, $/ac	Value, $/ac	Rent, $/ac
Northwest	540	32.50	255	9.70
West Central	450	30.00	230	9.30
Southwest	440	25.60	240	8.80
North Central	635	39.00	375	13.70
Central	640	34.40	405	12.40
South Central	670	32.90	340	11.20
Northeast	990	60.00	625	15.30
East Central	975	41.50	620	16.80
Southeast	745	36.50	500	15.20

[a] Kansas Agricultural Statistics, *Agricultural Land Values*, August 15, 2002.
Land values are for January 1, 2002; rents are for the year 2002.

Figures 1-4 on the following pages show CRD level land values and cash rents for non-irrigated cropland and pasture prorated to the county level. In order to prorate the CRD level land values and cash rents to the county level, several pieces of information were required in addition to the CRD level values reported in Table 1. First, some measure of county-to-county variability is required, and second, a measure of acres in each county is needed. Information gathered from 2000 to 2002 on county level cash rents and land values from the state Farm Service Agency (FSA) was used to index county-to-county variability.[1] After county indices were calculated, they were weighted to reflect the acres of non-irrigated cropland or pasture in that particular county relative to the CRD as a whole. The acreage weights were based on acres reported for each county in the 1997 Ag Census (USDA). The acreage-weighted indices were then multiplied by the CRD averages reported in Table 1 to give the county level values shown in Figures 1-4. Thus, the values shown in Figures 1-4, when multiplied by the respective acreage-based weights and summed, will exactly equal the KAS reported values at the CRD level.

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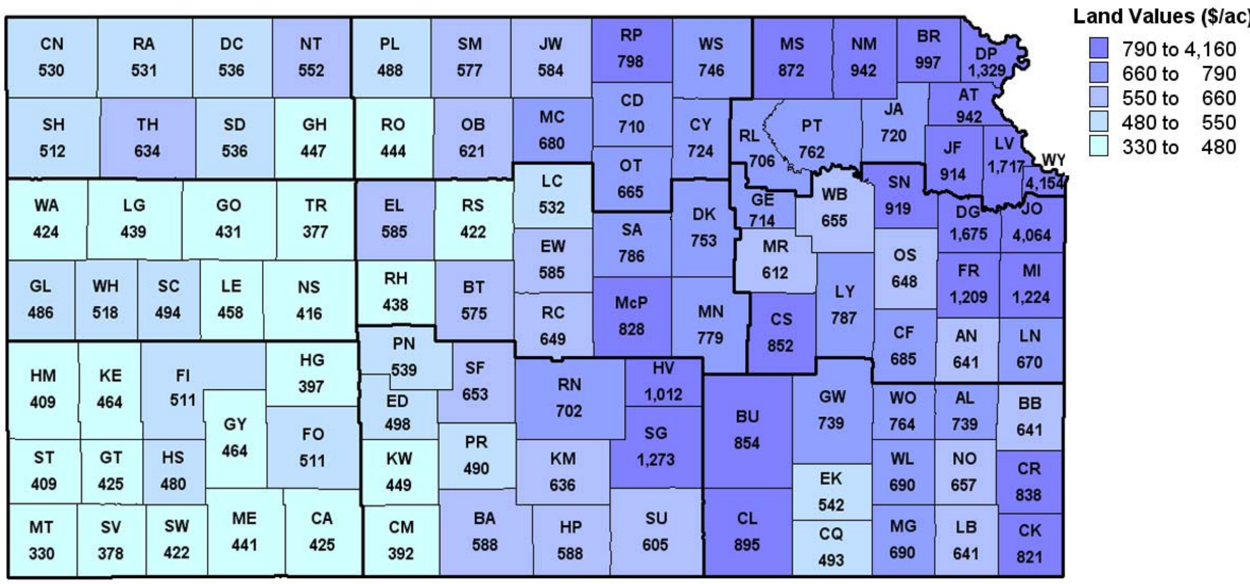
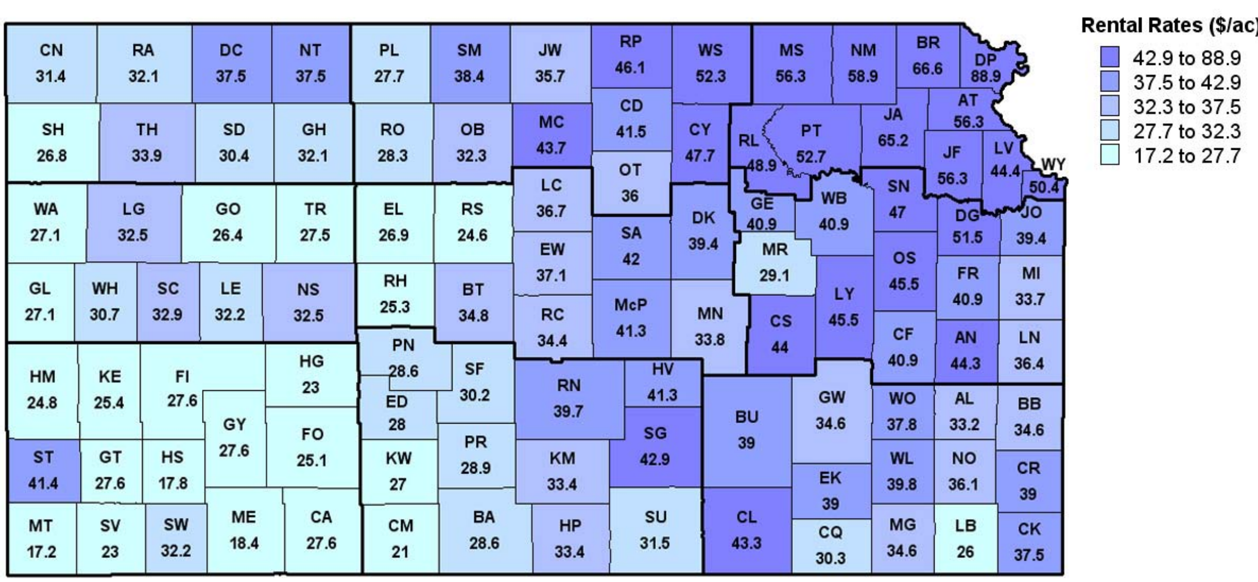
[1] This database is not publicly available and thus simply was used to create county indices for both cash rents and land values.

Figure 1. Kansas Non-Irrigated Land Values*



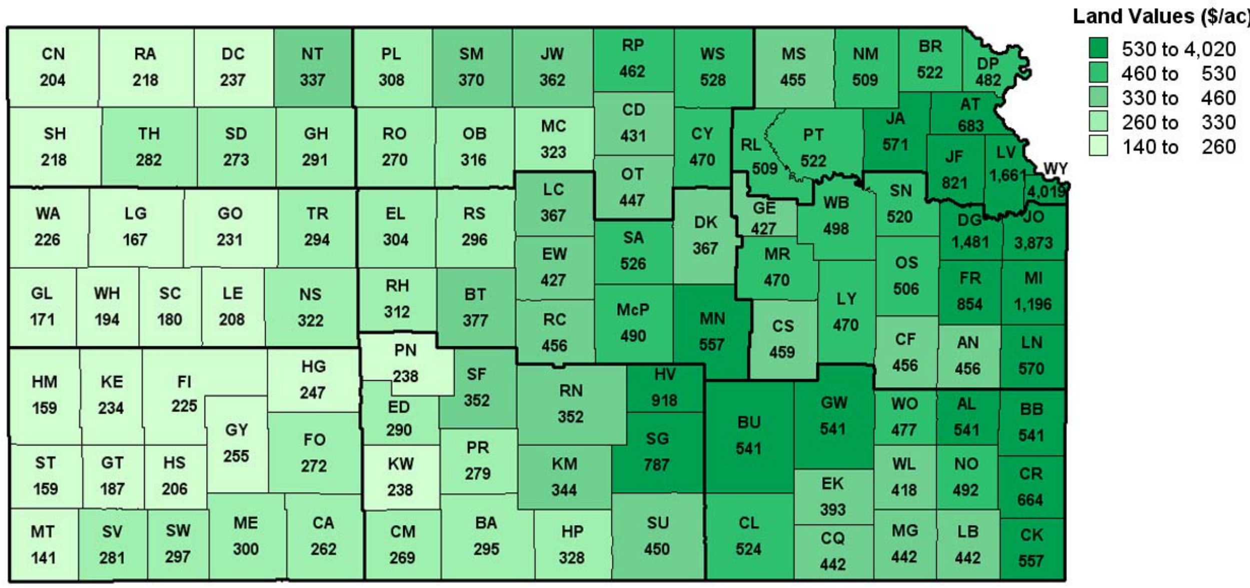
* Land values calculated using KAS crop reporting district values indexed to county level.

Figure 2. Kansas Non-Irrigated Cash Rents*



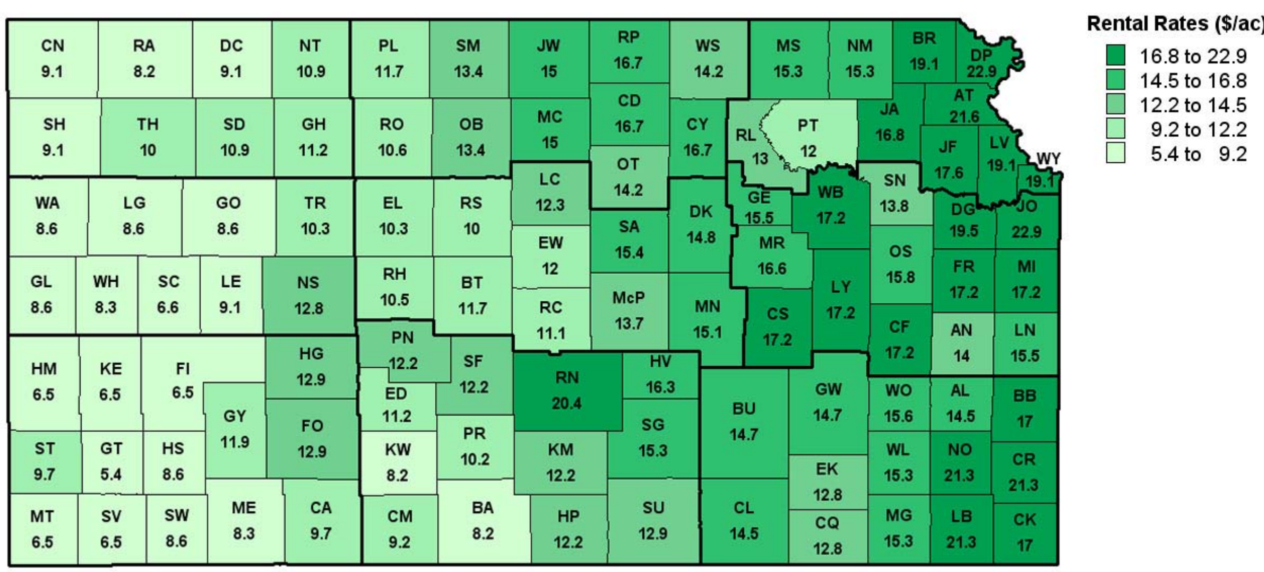
* Cash rents calculated using KAS crop reporting district values indexed to county level.

Figure 3. Kansas Pasture Land Values*



* Land values calculated using KAS crop reporting district values indexed to county level.

Figure 4. Kansas Pasture Cash Rents*



* Cash rents calculated using KAS crop reporting district values indexed to county level.