Impacts of Federal farm program payments on cropland values and rental rates: evidence from county-level data in South Dakota

Dr. Larry Janssen
Dept. of Economics
Box 504, Scobey Hall
South Dakota State Univ.
Brookings, SD 57007
Larry.janssen@sdstate.edu

Mr. Brian Button
Mayo Reference Service
Mayo Clinic
Rochester, MN 55902

Abstract

Farmland values, cash rental rates, and federal farm program payments steadily increased in the Northern Plains from 1991 – 2001. Econometric models are used to examine the impacts of Federal farm payments on cropland values and rental rates, statewide and regional, in South Dakota during this time period.

Selected paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Denver, Colorado, August 1 – 4, 2004

Impacts of Federal farm program payments on cropland values and rental rates: evidence from county-level data in South Dakota[1]

Dr. Larry Janssen and Mr. Brian Button[2]

Abstract

Farmland values, cash rental rates, and federal farm program payments steadily increased in the Northern Plains from 1991 – 2001. Econometric models are used to examine the impacts of Federal farm payments on cropland values and rental rates, statewide and regional, in South Dakota during this time period.

Background

Passage of the Farm Security Act of 2002 indicates continued importance of farm program payments in U.S. agriculture, despite various policy proposals attempting to reduce most farm program payments. Agricultural economics literature includes many articles on the impacts of Federal farm program payments on land values. In general, government payments accrue mainly to landowners, in the short-term through rising rental rates and in the longer-term through capitalization of farm program benefits into land values. Recent studies from the USDA – ERS suggest U.S. farmland values, in the absence of government payments, were 4 percent lower during the 1972 – 1981 period, 13 to 19 percent lower from 1982 – 1997, and 25 percent lower from 1998 – 2001 (Ryan,

---

[1] Selected paper presented at the 2004 Annual Meeting of the American Agricultural Economics Association Meetings, Denver, Colorado, August 1 -4, 2004

[2] Dr. Janssen is Professor, Dept. of Economics, South Dakota State University (SDSU), Brookings, SD; Brian Button is currently a marketing analyst for Mayo Reference Services, Mayo Clinic, Rochester, MN and was previously a graduate assistant (teaching and research) in the Dept. of Economics, SDSU, Brookings, SD. Funding for this research was from the Agricultural Experiment Station of South Dakota.

et.al. 2001b). Other studies estimated farm program effects on cropland value from 7 to 38 percent. Variations in these estimates are attributed to region, time period of study, and estimation method (Ryan, et.al. 2001a). The Northern Plains, which includes South Dakota, is considered to be one of the most farm program dependent regions in the United States.

Farm program payments to South Dakota producers and landowners have been steadily increasing from 1991 – 2001, a time period of continuous annual increases in nominal cropland values and rental rates (Janssen and Pflueger, 2002). The diversity of agricultural and socio-economic characteristics across the state and the relative importance of farm program participation make South Dakota useful for case studies of farm program impacts on land values. Furthermore, nearly 50 percent of South Dakota cropland is leased. Thus, farm program impacts on land values and cash rental rates are of considerable interest to current and prospective farmland owners and operators, farm lenders, and rural communities.

The overall objective of this study is to estimate the impact of Federal farm program payments on cropland values and rental rates in South Dakota. The approach used county-level data from South Dakota for the 1991 – 2001 time period to empirically estimate these impacts. Following a brief survey of previous works, data and methods used in this study are discussed along with presentation of descriptive statistics. Next, cropland value and rental rate models are specified and estimated using multiple regression models (SAS, version 8). Results from the alternative empirical models are presented and evaluated prior to concluding remarks and implications.

Previous Work

Federal farm program payments as a percent South Dakota farm receipts averaged 7 – 9 percent from 1991 – 1996 and increased to 17 – 18 percent from 1999 – 2001 (Anderson and Noyes, 2002). During this 11 year period, commodity support programs were 80 percent of farm program payments, while conservation program payments were 13 percent and disaster payments were 7 percent of Federal farm program payments in South Dakota.

Many previous studies conclude that farm programs have positive effects on farmland values. For example, Reynolds and Timmons (1969) using a simultaneous equation approach and state-level data from 1933 – 1965 found that increasing farm size, government programs, and expected capital gains were the main factors influencing farmland value changes. Chryst (1965) used a time series model found that technology change and price / income support programs have a positive effect on land values. Belongia (1985), upon investigation of land values changes during the 1970's and early 1980's, suggests "the rate of change in farmland prices will be determined by the expected rate of inflation, expected growth in real net returns from farming, which includes cash receipts and government payments minus variable costs, and the percentage change in the real rate of return on an alternate investment" (pp. 21).

Scott's (1989) study of Midwest farmland markets examined the effects of government payments on cash rent and on farmland values. Government payments were lagged in the model because expectations of future payments have an important effect on current land values. Clark, Fulton and Scott (1993) examined the inconsistency of land values, land rents, and capitalization formulas used over time. Overall, the authors

conclude that studies of land values require complex models including rational bubbles, risk aversion, and future shifts in government policies.

Barnard (2002) concluded that prior to the 1996 farm bill, the largest relative effect of farm program direct payments occurred on cropland values in the Northern Plains. Related work by ERS economists indicates the impact of farm program payments on cropland values depends on the type of program. They suggest that loan deficiency payments (LDP's) have less of an effect on cropland values than Agricultural Marketing Transition Act (AMTA) payments because input suppliers attain a share of LDP payments, which are related to amount of production, while fixed, but declining AMTA payments are tied to ownership of cropland previously enrolled in commodity programs. Ad-hoc disaster payments are expected to have some influence on cropland values, while Conservation Reserve Program (CRP) payments have an indirect, but upward pressure on cropland values. (Ryan, et.al. 2001a). Recent estimates of capitalization of farm program benefits highlights regional differences in percentage of land values accounted for by AMTA, LDP, and disaster payments. The relative influence of each program was higher in the Northern Plains and western Cornbelt than in other U.S. regions (Goodwin, et.al. 2003).

Gardner's (2003) analysis of agricultural land value data for 315 U.S. counties from 1950 to 1992 provides only weak evidence that farm programs have increased farmland values in the long run. Other factors related to growth in agricultural productivity and economic development / population growth at the county level are much more important explanations of long-run land value changes.

Peterson (1986) specifically examined the influence of farmland quality characteristics and the role of non-farm factors (such as population density) on the per acre value of farmland. Agricultural land prices were directly related to indices of land quality and to increased non-agricultural economic activity, as evidenced by increasing population density and higher prices for non-agricultural land.

The implications for this study are that farmland value models should specifically include land quality variables, farm program payments, and measures of economic development; farmland rental rate models should include measures of land quality and farm program payment variables. The most recent and comprehensive research on the interactions of government policies and farmland markets in the United States and Canada became available after completion of this research study (Moss and Schmitz, ed. 2003).

Data Sources and Methods

County level estimates of average cropland values and rental rates from 1991 – 2001 were developed from respondent data to the annual South Dakota State University (SDSU) Farmland Market Survey. County level information on farm program payments, socio-economic structure, and land productivity indices were added to the dataset.

Data on government agricultural payments and cropland acres were obtained from South Dakota Agricultural Statistics Bulletins. Total government agricultural payments per year in each county are the sum of commodity program payments, disaster payments, and Conservation Reserve Program (CRP) payments. Since almost all government agricultural payments are tied to cropland usage, the payments were calculated on a per cropland acre basis. The GNP-PCE deflator was used to deflate per acre government farm payments, cash rental rates, and cropland values. Government payments were

lagged one year because expectations of future payments have an important effect on current land prices as addressed by Scott (1989).

A socio-economic type variable, developed by Van der Sluis and Cordes (2002) classified counties by their population, urbanization, and economic trade center status. This variable has been used to examine federal spending impacts on Great Plains counties and is used here to examine possible impacts of socio-economic structure on cropland values at the county level. (Cordes and Van der Sluis, 2002). Three South Dakota counties are classified as metropolitan counties and the remaining 63 counties are classified into four non-metropolitan categories: nine "large trade center" counties with a city of at least 7,500 people, seven "small trade center" counties with the largest city having between 2,500 to 7,499 people, seventeen "rural" counties with no town larger than 2,499 people and with a population density of at least six people per square mile, and thirty "frontier" counties with no town larger than 2,499 and with a population density of less than six people per square mile (Van der Sluis and Cordes, 2002). A map of South Dakota counties by socio-economic type is shown in Figure 1. Socio-economic structure was entered as a set of binary dummy variables in the multiple regression models, with frontier counties as the base.

Cropland productivity is another key factor influencing cropland value or rental rate. As an approximation of land quality in each county, a productivity adjustment factor (PAF) variable is used in the model. The PAF considers the relative productivity of soils in each county for producing crops. The PAF is indexed relative to Union County, which received a PAF of 100, because it has the best environmental conditions

for cropland in South Dakota and has the most productive soils (Malo, 1998). The values of the PAF variable differ greatly by agricultural region in South Dakota.

A linear trend variable (1991 = 1 … 2001 = 11) was used to assess changes in technology and interest rates over the time period. This trend variable evaluates the annual impact of changes in real (inflation adjusted) cropland values and rental rates.

Descriptive Statistics

Data from the matrix of Pearson correlation coefficients showed that deflated per acre cropland values and cash rental rates were highly correlated (0.97). Both cropland values and rental rates were strongly correlated (0.90 to 0.92) with the cropland productivity variable. No other pair-wise correlations were above 0.55 (Button, 2003).

The mean, maximum, minimum, and mean values over the 11-year period for cropland values, cropland rental rates, government payments, cropland productivity, and population density are presented statewide and further evaluated by county socio-economic type, and for two time periods, 1991-1996 and 1997-2001.

The mean of South Dakota cropland value per acre for the 1991-2001 period deflated by the GNP-PCE deflator was $473. The maximum cropland value for the data set was $1252 in a rural county and the minimum was $145 in a frontier county. The mean value of per acre cash rental rates was $36.22. The minimum cash rental rate was $10.45 in a frontier county and the maximum cash rental rate was $86.42 in a rural county. For government payments per cropland acre, the mean value was $21.07 per acre. The maximum value for government payments was $5.48 in a frontier county and the maximum was $63.52 in a rural county (table 1).

Overall, higher government payments, cropland values and rental rates means are generally located in counties with higher population density and urban influence. Frontier and small trade center counties have the lowest average (mean) productivity factors and population densities. All frontier and rural counties were classified as farm dependent counties, while all metropolitan and large trade center counties were non-farm dependent counties. Small trade center counties were divided between farm dependent and non-farm dependent counties.

Data in table 2 contains summary statistics of cropland values, cash rental rates and government payments per acre for South Dakota for two time periods, 1991-1996 and 1997-2001, which represents the time period before and after the 1996 Farm Bill. The government payment mean for the period before the 1996 Farm Bill was $18.50, while the government payment period mean from 1997 to 2001 was $24.16 per cropland acre. This is roughly a 30 percent increase in government payments. However, average deflated cropland values increased by only seven percent ($458 per acre during the first period to $491 in the second period). Similarly, rental rates increased from $35.91 to $36.58, an increase of only two percent.

A Waller-Duncan k-ratio t-test, a multiple means comparison test, was used to examine differences in mean cropland values and cash rental rates per acre by the classification variables of time (year) and socio-economic structure code. Results show the mean value of cropland increased over time, with cropland value means generally higher in the 1997 – 2001 period than in the earlier 1991 – 1996 period (table 3).

Cropland value means associated with county socio-economic type were significantly different from each other. Results indicate cropland value means for

counties with higher population pressures and some degree of urbanization are greater than cropland value means in counties with lower population pressures.

Additional Waller-Duncan tests results indicate that the ratio of deflated government payments to cash rental rates (a proxy for dependency on farm program payments) varied substantially over time and by regional location (Button, 2003).

Model Specification, Results, and Discussion

Single equation multiple regression models are used to analyze factors explaining variation in cropland values or cash rental rates. The models are estimated using annual data from 1991 – 2001. The overall dataset consists of 592 observations – 54 county (or multi-county groups) and 11 years of cropland value, rental rate, and government payment data. All cropland value, rental rates, and farm program payment data are on a per acre basis and deflated (GNP – PCE, 1996=100) to remove the impact of general price inflation from the estimated results.

The base model for cropland value includes explanatory variables of land productivity, government farm program payments, a series of binary dummy variables for socio-economic structure, and a linear time trend variable. The base model for cropland cash rental rates includes explanatory variables for land productivity, government farm program payments, and a linear time trend.

The impact of government payment shifts across regional cropland values and rental rates are considered by adding a series of slope dummy variables for government payments * region to the base model equation. A restricted F-test is used to evaluate the statistical significance of this added set of variables to the base model (Gujarati, 2003).

The impact of the 1996 Farm Bill on cropland values and rental rates were considered by using intercept and slope dummy variables for the pre and post time periods (1991 – 1996 and 1997 – 2001). The intercept dummy variable (FBDUM) is equal to one for the period 1997 – 2001 and a value of zero for the 1991 time period. The slope dummy variable (CFBDUM) is the amount of per acre government payment times FBDUM. In this model specification, linear time trend was removed as an explanatory variable due to high collinearity with the farm bill dummy variables. A restricted F-test was used to test the difference in cropland values and rental rates between the time period before and after the enactment of the 1996 Farm Bill.

Differences in cropland productivity and socio-economic structure (frontier, rural, trade center, and metropolitan) of counties were the major factors explaining spatial variation in cropland values. In the base models, a one unit increase in cropland productivity is expected to increase cropland values by $16.87 per acre and cropland cash rental rates an average of $1.34 per acre. Relative to frontier counties, cropland values were significantly higher ($p<0.01$) in metropolitan, trade center, and rural counties (table 4).

Coefficients for government program payments, in all model specifications, are highly significant ($p<0.01$) in the overall explanation of cropland values and rental rates during the 1991 – 2001 time period. In the base model results, the net impact of a $1.00 per acre increase in farm program payments leads to a $1.18 per acre increase in cropland value and $0.08 increase in cash rental rates the following year. The F-test to determine if regional variation in farm program payments has a substantial impact on cropland values

or rental rates are highly significant ($p<0.01$) in both models with an F-value of 22.48 in the cropland value model and 20.75 in the rental rate mode1 (tables 4 and 5).

Government payments had greater relative influence on cropland values and rental rates in the western and south-central regions than in the more cropland intensive regions of eastern South Dakota. This finding is consistent with data showing higher dependence on CRP payments and a higher ratio of per acre farm program payments to cropland net returns in western South Dakota than in eastern or central regions of South Dakota (Button, 2003).

The coefficient for linear time trend (TYEAR) indicates deflated cropland values increased an average of $3.50 to $3.94 per acre, depending on model, each year from 1991 to 2001, a statistically significant result ($p<0.01$). However, deflated cash rental rates did not increase significantly during the same period. This result is consistent with other findings indicating that the ratio of gross cash rents to cropland values declined during this period (Button, 2003).

In real terms, Federal farm program payments per cropland acre in South Dakota increased by 30 percent from the 1991 – 1996 time period to the post-1996 farm bill period of 1997 – 2001 (see data in table 2**)**. However based on regression model results, the relative influence of federal farm program payments on cropland values did not significantly change between the two time periods. The individual coefficients for FBDUM and CFBDUM as well as the calculated F-statistic of 2.08 for the added two variables were not significant at even the 0.10 probability level (table 4).

The relative impact of federal farm program payments on cash rental rates was lower after the 1996 farm bill, compared to the six years after the 1990 farm bill. A $1

per acre increase in government payments increases cash rental rates by $0.03 after the 1996 Farm Bill, compared to $0.19 per acre in the earlier period (table 5). The calculated F-statistic of 21 for adding the two farm bill impact variables to the rental rate model is highly significant ($p<0.01$). The structural change of Federal farm program payments to fixed, but declining, AMTA payments and from deficiency payments to loan deficiency payments are possible explanations for this interesting result.

Depending on model specification, the R^2 values vary from 0.85 to 0.89 indicating the independent variables explain 85% to 89% of the variation in cropland values or rental rates per acre. Most of the coefficients are statistically different from zero at the 0.01 probability level of significance. Analysis of SAS collinearity diagnostic statistics (variance inflation factors less than 2.0) indicates no multicollinearity problems.

A final alteration to the base cropland value and rental rate models was to re-estimate these models by transforming the continuous numerical variables to their logarithmic form, which permits direct evaluation of the elasticity or the percentage change in cropland value or rental rates with respect to changes in government payments. The continuous variables include cropland value and rental rates, government payments, and land productivity.

Results for the cropland value and rental rate models are summarized in table 6. The R^2 values for both equations were 0.88 and 0.89 respectively. All of the coefficients were significant at the 0.05 or 0.01 probability level. Based on logarithm model results, a 10 percent increase in government payments will lead to 0.3 percent increase in cropland values and 0.5 percent increase in cash rental rates, given all other variables in the model.

Summary, Conclusions, and Implications

Federal farm program payments, from production-based programs to conservation programs, have become a steady source of income in various forms for farmers and agricultural landowners. Evaluating the impacts of government programs on cropland values and rental rates is of interest to producers, landowners, and lawmakers. Despite low agricultural commodity prices from 1998 - 2001, cropland values and rental rates have continued to rise in South Dakota. The question is how much of the increase in cropland values and rental rates are associated with government payments.

Single equation multiple regression (OLS) models were developed to estimate the impact of government payments and other factors on South Dakota cropland values and rental rates. The county-level cropland value and rental rate data comes from the annual South Dakota Farm Real Estate Market Survey from 1991 to 2001. County-level data on socio-economic structure, cropland productivity, annual Federal farm program payments, and other data came from university research sources or various government agencies such as the South Dakota Agricultural Statistics Service.

Explanatory variables in the base model for cropland value included government payments per cropland acre, an index of cropland productivity, county socio-economic structure, and a linear time trend variable. For the rental rate regression model, the explanatory variables of government payments per cropland acre, soil productivity and time trend were used. All of the regression coefficients for the explanatory variables in the base model were significant at the 0.01 probability level for both cropland values and rental rates, except the time trend coefficient was not statistically significant in the rental rate model. The impact of government payments on cropland values and rental rates

varied significantly across agricultural regions. The relative impact of federal farm program payments on cash rental rates was lower after the 1996 farm bill, compared to the previous six years after the 1990 farm bill. The relative impact of federal farm program payments on cropland values was similar in both time periods.

The regression models provided statistical evidence that government payments significantly impacted South Dakota cropland values and rental rates from 1991 – 2001. Ultimately, both cropland value and rental rate means, statewide, would have been roughly five percent less if there had been no farm program payments throughout the time period.

A major conclusion of this study is that the influence of government payments did not significantly change for cropland values before and after the 1996 Farm Bill. On the other hand, the influence of government payments on rental rates became less influential after the 1996 Farm Bill. An implication could be that the structural change associated with government payments after the 1996 Farm Bill did not increase cropland values or cash rental rates as much per dollar of payment subsidies as in previous programs. One structural change in the 1996 Farm Bill is that loan deficiency payments (LDPs) replaced deficiency payments on program acres and yields. LDP's have less of an influence on cropland values and rental rates because LDP payments received by producers are quickly used to obtain inputs. Thus, the suppliers of the inputs also reap the benefits of increased government payments indirectly (Ryan, et.al. 2001b). Also, the Agricultural Market Transition Act (AMTA) payments are fixed and declining throughout the period. Since AMTA payments were made directly to producers, they would affect cropland values and rental rates more than LDP payments.

During the study period, a possible reason that cropland rental rates did not increase as fast as cropland values could be attributed to the varied socio-economic structures of South Dakota counties. Metropolitan counties and non-metropolitan trade center counties have grown in population, while most rural and frontier counties have held steady or declined in population. Population growth and growing demand for urban-style amenities in the countryside (rural residential acreages, recreation sites etc.) especially in eastern South Dakota push up rural land values, including cropland values.

Another conclusion is that land productivity is more influential than government payments on cropland values and rental rates. Land productivity, enhanced over time with improvements in agricultural technology, is more "permanent" than the magnitude of government payments from ever-changing Federal farm programs. Further research is warranted on estimating the relative impacts of different farm program instruments on agricultural land values.

Finally, other econometric modeling approaches should be examined, including the use of recursive or simultaneous models, in the estimation of farm program impacts. With a recursive model approach, a researcher could place the predicted rent variable into the value equation. In a simultaneous model, the predicted value and rent variables are used concurrently in both the cropland value and rental rate equations.

Bibliography

Anderson, C., and Noyes, S.W. (2002). "South Dakota Agriculture 2002." South Dakota Agricultural Statistics Service. Sioux Falls, South Dakota.

Barnard, C. (November 2002). "Land Use, Value, and Management: Agricultural Land Values." Economic Research Service, United States Department of Agriculture.

Belongia, M. (August 1985). "Factors Behind the Rise and Fall of Farmland Prices: A Preliminary Assessment. *Federal Reserve Bank of St. Louis*, 18-24.

Button, B. (2003). Government Payments and South Dakota Land Values and Rental Rates. M.S. Thesis, South Dakota State University, Brookings, S.D.

Chryst, W. E. (December 1965). "Land Values and Agricultural Income, a Paradox?" *Journal of Farm Economics*, 47, 1265-1277.

Clark, S., Fulton, M., and Scott, J.T. Jr. (February 1993). "The Inconsistency of Land Values, Land Rents, and Capitalization Formulas." *American Journal of Agricultural Economics,* v75 i1, 147-155.

Cordes, S.M. and Van der Sluis, E. (2002). "The Contemporary Role of the Federal Government in the Great Plains Economy: A Comprehensive Examination of Federal Spending and Related Fiscal Activities. *Great Plains Research* 11(2):301 – 326.

Gardner, B. (2003). "U.S. Commodity Prices and Land Values." Chpt. 5 IN Moss, C.B. and A. Schmitz,ed. Government Policy and Farmland Markets: the Maintenance of Farmer Wealth. Iowa State Press. Ames, IA. pp. 81 – 95.

Goowin,B.K; Mishra A, and Ortalo-Magne, F.N. (2003). "Explaining Regional Differences in the Capitalization of Policy Benefits into Agricultural Land Values." Chpt. 6 IN Moss, C.B. and A. Schmitz, ed. Government Policy and Farmland Markets: the Maintenance of Farmer Wealth. Iowa State Press. Ames, IA. pp. 97 – 114.

Gujarati, D. (2003). "Basic Econometrics, 4th Edition." McGraw-Hill. New York.

Janssen, L. and Pflueger, B. (2002). "South Dakota Farmland Market Trends, 2001-2002." South Dakota State University, Economics Department. SDSU AES Circular C267. 2002.

Malo, D. (1998). "South Dakota Soil Survey Code Information and Soil Productivity Adjustment Factors." Plant Science Dept. South Dakota State University, Brookings, SD.

Moss, C.B. and Schmitz, A. ed. (2003). Government Policy and Farmland Markets: the Maintenance of Farmer Wealth. Iowa State Press. Ames, IA.

Peterson, W. (November 1986). "Land Quality and Prices." *American Journal of Agricultural Economics,* v68 i4 812-819.

Reynolds, J.E. and Timmons, J.E. (1969). "Factors Affecting Farmland Values in the U.S." Research Bulletin 566. Agricultural Experiment Station, Iowa State University, Ames.

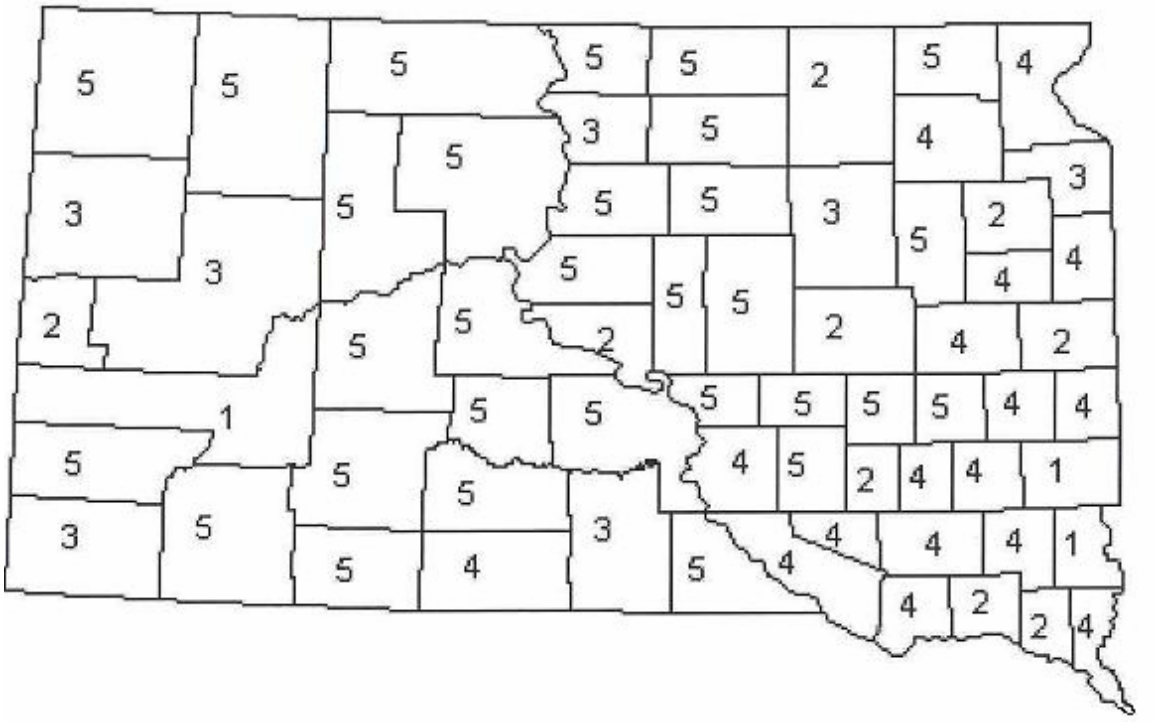
Ryan, J., Barnard, C., and Collender, R. (June-July 2001a). "Government Payments to Farmers Contribute to Rising Land Values." Economic Research Service, United States Department of Agriculture. Agricultural Outlook.

Ryan, J., Barnard, C., and Collender, R. (June-July 2001b). "Higher Cropland Value from Farm Program Payments: Who Gains." Economic Research Service, United States Department of Agricultural. Agricultural Outlook.

Scott, J.T. Jr. (May 1989). "Midwest Farmland Values and Government Subsidies to Agriculture." University of Illinois at Urbana-Champaign, Department of Agricultural Economics, Urbana, Illinois.

"U.S. Census 2000." (2002) United States Census Bureau.

Van der Sluis, E., and Cordes, S. (March 2002). "A Look At Federal Spending in South Dakota." *Economics Commentator*, Number 427.



Socioeconomic Type	Numerical ID	Frequency
Metropolitan	1	3
Large Trade Center	2	9
Small Trade Center	3	7
Rural	4	17
Frontier	5	30

Source: Van der Sluis and Cordes (2002)

Figure 1 Classification of South Dakota Counties by Socioeconomic Type

Table 1: Summary Statistic by Socioeconomic Structure						
Metropolitan				**Rural**		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Government Payments	$22.87	$7.33	$57.76	$24.36	$8.33	$63.52
Cropland Value	$777.93	$198.11	$1,219.46	$638.29	$338.54	$1,252.57
Rental Rates	$55.90	$16.55	$82.01	$48.21	$25.51	$86.42
Productivity Factor	83.73	58.20	98.00	86.07	71.00	100.00
Population Density	85.30	30.90	183.30	11.03	5.10	27.40
Large Trade Center				**Frontier**		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Government Payments	$23.24	$9.23	$56.78	$18.45	$5.48	$45.63
Cropland Value	$598.70	$357.66	$1,098.90	$308.88	$145.36	$660.97
Rental Rates	$45.31	$23.05	$79.16	$24.40	$10.45	$45.60
Productivity Factor	83.81	68.00	96.00	70.41	58.10	86.00
Population Density	28.63	13.50	41.50	3.18	0.90	7.00
Small Trade Center				**State**		
	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Government Payments	$18.56	$6.43	$49.03	$21.07	$5.48	$63.52
Cropland Value	$336.29	$145.58	$663.60	$473.44	$145.36	$1,252.57
Rental Rates	$26.87	$13.15	$58.89	$36.22	$10.45	$86.42
Productivity Factor	67.77	55.00	84.00	77.17	55.00	100.00
Population Density	6.04	4.00	11.50	14.09	0.90	183.30

Note: Cropland Value and Rental Rate and Government Payment data were deflated by the GNP-PCE deflator, where 1996 was the base year.

Sources: South Dakota State University Farm Real Estate Market Surveys from 1991-2001, South Dakota Agricultural Bulletins from 1991-2001, SDSU Soils Department and U.S. Census Bureau.

Table 2: Pre and Post 1996 Farm Bill Statistics			
1991-1996			
	Means	Minimum	Maximum
Government Payments	$18.50	$5.60	$57.47
Cropland Value	$458.45	$147.98	$1,113.47
Rental Rates	$35.91	$10.45	$82.23
1997-2001			
	Means	Minimum	Maximum
Government Payments	$24.16	$5.48	$63.52
Cropland Value	$491.44	$145.36	$1,252.57
Rental Rates	$36.58	$12.50	$86.42

Note: All data were deflated by the GNP-PCE deflator, where 1996 was the base year.

Table 3 Waller-Duncan Test Results for Cropland Value and Rental Rates

Cropland Value by Year

Mean	Year	Waller Grouping	
512.53	2001	A	
501.05	1998	A	B
486.80	1999	A	B
480.44	2000	A	B
476.58	1997	A	B
461.74	1995	A	B
459.94	1993		B
459.75	1996		B
457.93	1994		B
457.69	1992		B
453.63	1991		B
Minimum Significant Difference			50.789
Overall Mean			473.440

Rental Rate by Year

Mean	Year	Waller Grouping	
37.45	1998	A	
37.01	1991	A	B
37.00	2001	A	B
36.68	1993	A	B
36.56	1997	A	B
36.42	1992	A	B
36.27	1999	A	B
36.09	1994	A	B
35.65	2000	A	B
34.70	1996		B
34.60	1995		B
Minimum Significant Difference			2.645
Overall Mean			36.217

Cropland Value by Socioeconomic Class

Mean	Region	Waller Grouping	
777.93	Metropolitan	A	
638.29	Rural	B	
598.70	Large Trade Center	C	
336.29	Small Trade Center	D	
308.88	Frontier	E	
Minimum Significant Difference			28.068
Overall Mean			473.440

Note: Means with the same letter are not significantly different.

Table 4: Summary of Regression Results for Cropland Values			
Variable	Base Model Parameter Estimate	Government Payment Shifts Across Regions	1996 Farm Bill Shift
Intercept	-921.721 (-28.20***)	-1074.681 (-20.51***)	-906.683 (-27.31***)
Productivity Variable (PAF)	16.871 (36.86***)	18.599 (28.38***)	16.839 (36.97***)
Government Payments (LD2GPAYA)	1.178 (3.11***)	2.77 (5.59***)	1.014 (1.50)
Rural (D1CTYT1)	58.329 (4.98***)	64.72 (5.85***)	58.223 (4.98***)
Small Trade Center (D2CTYT1)	72.004 (5.82***)	76.211 (6.65***)	72.123 (5.84***)
Large Trade Center (D3CTYT1)	58.091 (4.45***)	59.402 (4.93***)	58.001 (4.45***)
Metropolitan (D4CTYT1)	239.098 (13.09***)	216.575 (12.48***)	239.293 (13.12***)
Trend Variable (TYEAR)	3.495 (2.68***)	3.941 (3.30***)	
East Central * Government Payments (GR1DUM)		-1.999 (-4.64***)	
Northeast * Government Payments (GR2DUM)		-3.892 (-8.29***)	
North Central * Government Payments (GR3DUM)		-1.274 (-1.82*)	
Central * Government Payments (GR4DUM)		-1.125 (-1.56)	
South Central * Government Payments (GR5DUM)		3.412 (3.49***)	
Southwest * Government Payments (GR6DUM)		2.967 (2.00**)	
Northwest * Government Payments (GR7DUM)		1.501 (1.39)	
Farm Bill Dummy (FBDUM)			17.561 (1.01)
Farm Bill Influence (CFBDUM)			0.352 (0.46)
Overall Model Statistics			
R-squared	0.86	0.89	0.86
F-Value	500.72	317.81	439.67
Number of Observations	592	592	592

***significant at the 1% level

**significant at the 5% level

The t-statistic for the coefficient is listed in parenthesis below each coefficient.

Table 5: Summary of Regression Results for Cropland Rental Rates			
Variable	Base Model Parameter Estimate	Government Payment Shifts Across Regions	1996 Farm Bill Shift
Intercept	-67.89 (-35.23***)	-76.57 (-21.03***)	-70.968 (-35.83***)
Productivity Variable (PAF)	1.34 (53.08***)	1.43 (32.19***)	1.34 (53.88***)
Government Payments (LD2GPAYA)	0.08 (3.13***)	0.22 (6.29***)	0.191 (3.99***)
Trend Variable (TYEAR)	-0.12 (-1.28)	-0.08 (-0.94)	
East Central * Government Payments (GR1DUM)		-0.194 (-6.28***)	
Northeast * Government Payments (GR2DUM)		-0.229 (-6.83***)	
North Central * Government Payments (GR3DUM)		-0.153 (-3.17***)	
Central * Government Payments (GR4DUM)		-0.208 (-4.16***)	
South Central * Government Payments (GR5DUM)		0.002 (0.03)	
Southwest * Government Payments (GR6DUM)		0.338 (3.24***)	
Northwest * Government Payments (GR7DUM)		0.01 (1.30)	
Farm Bill Dummy (FBDUM)			3.437 (2.80***)
Farm Bill Influence (CFBDUM)			-0.164 (-3.01***)
Overall Model Statistics			
R-squared	0.85	0.88	0.86
F-Value	1715.32	473.22	870.31
Number of Observations	592	592	592

***significant at the 1% level

**significant at the 5% level

The t-statistic for the coefficient is listed in parenthesis below each coefficient.

Table 6: Summary of Regression Results for Cropland Values and Rental Rates using Logarithmic Transformation

Variable	Cropland Value Coefficients	Cropland Rental Rate Coefficients
Intercept	-6.086 (-22.80***)	-8.897 (-48.69***)
Productivity Variable (LOGPAF)	2.738 (42.20***)	2.828 (63.71***)
Government Payments (LOGLDGPA)	0.032 (1.94*)	0.047 (3.23***)
Trend Variable (TYEAR)	0.006 (2.63***)	-0.003 (-1.54)
Rural (D1CTYT1)	0.176 (8.05***)	
Small Trade Center (D2CTYT1)	0.169 (7.25***)	
Large Trade Center (D3CTYT1)	0.190 (7.76***)	
Metropolitan (D4CTYT1)	0.349 (10.29***)	
Overall Model Statistics		
R-squared	0.88	0.89
F-Value	636.3	2404.17
Number of Observations	592	592

***significant at the 1% level

*significant at the 10% level

The t-statistic for the coefficient is listed in parenthesis