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A CROSS SECTIONAL ANALYSIS OF AGRICULTURAL LAND PRICES IN NEBRASKA 1978-1982

by   Gordon Carriker
Charles Curtis
and
Bruce Johnson

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A CROSS-SECTIONAL ANALYSIS OF AGRICULTURAL LAND

PRICES IN NEBRASKA, 1978 TO 1982 [1]

By

Gordon L. Carriker, Charles E. Curtis, and Bruce B. Johnson [2][3]

INTRODUCTION

PROBLEM STATEMENT

Land value expectations are important to land owners, agricultural producers, lenders, governmental agencies, and other parties. Greater understanding of land values and the factors involved in their determination is therefore beneficial to the decision-making process.

The analysis of farmland values has been a major focus of the agricultural economics profession for several decades. Early research focused primarily on the measurement of the relationship of income levels to land values. In more recent years, econometric models have attempted to uncover additional economic factors which influence the value of farmland.

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[3] Graduate Research Assistant, Instructor, and Associate Professor, respectively, Dept. of Agricultural Economics, University of Nebraska - Lincoln. Names appear in alphabetical order; no assignment of senior authorship is made.

Econometric models have used many quantification techniques
ranging from single-equation ordinary least squares regression to
systems-of-equations simulation. Data bases utilized in these
studies have also been diverse, ranging from private survey
information to Census of Agriculture data, the latter being the
most common.

Many of the models have received criticism for being too
broad geographically or insensitive to value changes over time.
In particular, models of the U.S. farmland market have needed to
assume homogeneity of land and its use throughout the nation.
Also, the utilization of nationally-aggregated time-series data
perceivably smooths-out any short-term fluctuations in farmland
values caused by varying expectations on the part of the market
participants.

The very nature of the farmland market necessitates a more
regionalized time-specific study. The analysis should allow for
spacially sensitive factors to merge into the value estimation
process which are otherwise forgone when more general, aggregated
data are used.

The primary focus of this study is to gain a clearer under-
standing of the Nebraska farmland market and the components which
influence land values. While identification of the relevant
factors that influence agricultural land values has been the
focus of several recent studies, the specific nature of this
study's data source provides a unique opportunity to analyze the
agricultural real estate market by sub-state regions.

PROJECT OBJECTIVES

The specific objectives are:

1) To identify the factors explaining the variation in agricultural land market prices in Nebraska.

2) To attempt disaggregation of heterogeneous agricultural land markets within Nebraska Crop Reporting Districts utilizing evidence developed in Objective 1.

3) To identify any changes in structural relationships that might have resulted from the advent of land value decline in recent years.

Objective 1 can be restated as "general model specification." Several of the factors examined have been used in one or more previous studies. All are variables that are consistant with current economic thought regarding land valuation.

Disaggregation of heterogeneous agricultural land markets allows for price adjustment due to locally-specific factors (e.g. a localized soil or water constraint). Limiting aggregation to within a particular crop reporting district, which was originally delineated on the basis of commodity production and cultural practices, is done to provide for the unique nature of the crop and livestock enterprises within these regions.

In many past modeling efforts, the land market studied was generally characterized as one of value appreciation only. In recent years we have witnessed declines in agricultural land values, both in nominal and real terms. It is believed that not only would a more localized study result in more understanding of Nebraska's farmland market, but that allowances for structural change due to recent deflation of land values, would also "fine tune" the analysis.

REVIEW OF PREVIOUS STUDIES

There have been many attempts to formulate an econometric model
of the U.S. farmland market as well as subnational farmland markets.
Those which provided a base for this study have appeared within the
last twenty years.

NATIONAL MODELS

In the early to mid-1960's, the agricultural land market
began to gain the attention of many economists primarily due to
post-World War II appreciation of farm real estate values. Two
decades of farm real estate value appreciation at a rate higher
than the rise in general price indices accompanied by lagging
farm incomes led many to question whether or not farm real estate
was being overvalued. Analysts began to question whether factors
other than discounted expected returns to land also influenced
the pricing mechanism.[Barlowe, pp.359-60;Healy and Short,p.8]

There are six models of the U.S. farm real estate market
that have been specified since 1966 that are noted herein. They
are:

    1)   Tweeten and Martin's five-equation recursive model
    2)   Herdt and Cochrane's two-equation, two-stage least
        squares model
    3)   Reynolds and Timmon's two-equation recursive model
    4)   Reinsel's single-equation, ordinary least squares
        model
    5)   Pope's et. al. Modification of Klinefelter's single-
        equation, ordinary least squares model
    6)   Duncan's single-equation, ordinary least squares
        model.

Tweeten and Martin's five equation system attempted to simulate various aspects of the farmland market that would typically be involved in price determination in a normal market. It did not, however, provide for a dichotomous supply-demand relationship in which separate functions are specified for supply and demand with equilibrium being assumed. The authors stated that this was due to variable interactions associated with more than one of these defined functions. In their model, national data for the years 1923 to 1963 were used to estimate equations for the number of farm transfers, total number of farms, total cropland in acres, and total land in farms. The predicted values for these variables were then used for values of the endogenous variables in estimating the equation for the deflated price index of U.S. farm real estate.[Tweeten and Martin] This model speci-fication is one of the more complicated to date.

Also appearing in 1966, Herdt and Cochrane's model provided for a demand-supply equilibrium relationship. Using a two-stage least squares technique and national data for the years 1913 to 1962, they specified two similar models to simultaneously estimate the number of farms supplied and the price per acre of farmland.[Herdt and Cochrane]

In 1969, Reynolds and Timmons specified what seems to be the last system of equations model for farm real estate values. Using the concept of delayed decision making, as did Tweeten and Martin, and the concept of market equilibrium, as did Herdt and Cochrane, they specified a two-equation recursive system. This model estimated the number of farmland transfers for the years 1933 to

1965 which in turn became the value for the single endogenous variable in the equation for the value per acre of farmland for the same years.[Reynolds and Timmons]

The remaining three model specifications utilized single equation techniques to explain variations in average value per acre of U.S. farm real estate. Reinsel's 1973 model is unique in that it did not incorporate local structural factors that affect land prices at the subnational level. He specified a model, using national data from 1947 to 1972, to predict the 1971 and 1972 national average value per acre in terms of the M2 money supply and population. He also noted that using data that represent national averages of these structural factors mask the variations that are inherent in local markets and that, in fact, a national farm real estate market does not exist.[Doll and Widdows]

In 1979, Pope, Cramer, Green, and Gardner modified a single-equation model of Illinois farmland values into one that would estimate national farmland values. Their intent was to compare the forecasting accuracy of a single-equation ordinary least squares model to that of the various multiple equation models previously discussed. Utilizing a national data base for the periods of 1913 to 1972 and 1946 to 1972, they concluded that the single-equation specification provided forecasting accuracy as good as, if not better than, the more sophisticated models.[Pope, et. al.]

Duncan presented a more recent model of U.S. farmland values in 1979. The principle objective of his model was to estimate structural parameters (rather than a forecasting instrument) for the time periods of 1929 to 1975 and 1937 to 1975.[Duncan]

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SUBNATIONAL MODELS

Several subnational models have been specified, often
patterned after one or more of the national models cited above.
All subnational land market models reviewed here have appeared
since 1970.

In 1973, Klinefelter presented what is now a frequently
cited subnational econometric model of farmland values. Using
aggregate time-series data for average farmland values in
Illinois, single-equation least-squares regression was employed
to explain the value of farmland and improvements, for that state
between 1951 and 1970.[Klinefelter] As noted by Pope, et. al.,
results of this model specification when modified for national
data, proved to be comparatively accurate in forecasting relative
to more exotic modeling processes. In 1983, Kraft and Belbase
also specified an Illinois farmland value model similar to
Klinefelter's, utilizing an updated data base, and tested for a
structural break in the model during the year 1970.[Kraft and
Belbase]

Ziemer and White, in 1981, utilized a process called Tobit
analysis on aggregate time-series data to estimate the farmland
acres purchased (demanded) in Georgia for the time period of 1970
to 1978. Tobit analysis is a maximum-likelihood estimation
process that attempts to account for the cumulative probability
density of the sample of observations not being equal to that of
the general population. In this case, they attempted to account
for market non-participants who, had their situations been
different relative to the variables in the model, might have

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entered into the bidding process for Georgia farmland during these years.[Ziemer and White]

Two other models utilized aggregate time-series data in conjunction with the least-squares procedure. Chavas and Shumway included a soil and climate rating (Corn Suitability Rating) as well as delineated regions below the state level in their model of average farmland values for five crop reporting districts in Iowa between 1967 and 1977.[Chavas and Shumway] Sandrey, Arthur, Oliveira, and Wilson used a very similar data base as that used by Klinefelter, although instead of using aggregate state data, pooled county data for the state (Oregon) were used to estimate average farmland values from 1954 to 1978.[Sandrey, et.al]

Three of the reviewed research efforts utilized farmland market data from the Federal Land Bank Management Information Services in various Farm Credit Districts. In 1975, Herr specified two single equation models to analyze the impact of mortgage financing terms on prices for similar farmland in Iowa and South Dakota from late 1971 to early 1973.[Herr] The other two studies utilized FLB data provided by the Federal Land Bank of Columbia, South Carolina. In 1978, Vollink estimated a single equation model, by least-squares regression, for four regions in North Carolina delineated on the basis of similarity in agricultural conditions.[Vollink] In 1983, Clifton and Spurlock used a parametric method to aggregate counties throughout the Southeastern U.S. (the Carolinas, Georgia, and Florida) into homogeneous markets. Once the region was segmented, the study estimated a single equation model of farmland values for each submarket for the period of 1971 to 1979.[Clifton and Spurlock]

In 1982, Burton and Nelson estimated four individual county models of farmland prices in Eastern Oklahoma using specific tract information acquired from legal records from 1976 to 1978.[Burton and Nelson] In 1983, Scott and Chicoine aggregated Illinois counties on the basis of agricultural outputs and estimated models for these regions using data from tax records of sales occurring between 1975 and 1980.[Scott and Chicoine]

All of these subnational models have utilized single equation regression techniques and have demonstrated some predictive accuracy, at least within the sample periods.

THEORETICAL BASE AND MODEL DEVELOPMENT

NATURE OF THE FARMLAND MARKET

The farmland market is far from being a purely competitive market. There is no homogeneous product; each parcel is unique. There are relatively few buyers and sellers at any given point in time or locality; therefore, price may be heavily influenced by unique characteristics of the market participants. The motives for purchase and sale of farmland are not always economically rational nor based upon comprehensive market knowledge. Finally, the market resources are basically localized and spacially confined rather than being freely mobile.

In a normal market, the equilibrium price for a good is decidedly influenced by the willingness of the buyer(s) to pay the minimum acceptable price of the seller(s). The same is somewhat true in the farmland market. But, farmland, being a highly durable good with rather limited availability for purchase, tends to have an economic supply which is quite inelastic. Therefore, transaction prices are largely driven by the demand side of the market. At times, this will manifest in situations of aggressive bidding; the result can be "overbidding" by two or more optimistic bidders speculating on future land prices and/or earnings flow.

Realistically, the farmland market may be visualized as a less-than purely competitive market which becomes even less competitive as the final settlement and transfer of a tract's title

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approaches completion.

DETERMINATION OF FARMLAND VALUE/PRICE

Farmland values, as one might expect, are determined by supply and demand forces operating in the farmland market. Ordinarily sought as a measure of this value is the actual sales price or a subjective approximation of the market bid price. The principle of substitution suggests an economically-rational buyer will pay no more for a parcel than the price of other qualitatively-adjusted available properties or that of other comparable income-producing alternatives. Yet, because of infrequency of transfer, lack of parcel homogeneity, and imperfect market knowledge, decisions may only crudely approximate this principle. Hence, in the farmland market, individual judgement plays a greater part in the valuation process than in the market of a more standardized good.

As stated earlier, the price that is paid for a parcel of farmland is ultimately determined by what a buyer is willing to offer and a seller willing to accept. The process that both buyer and seller separately should undergo to decide on a range of feasible prices is fourfold:

1) determination of the capitalized flow of discounted expected net returns to the parcel;

2) addition and/or subtraction of values assigned by the individual to the various amenity factors associated with the parcel;

3) comparison of the parcel in question to comparable parcels in the area and/or other available investment alternatives;

4) comparison of asking price to market norms and relative market strength.

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Each having done so, an agreement between buyer and seller will be reached if these two ranges intersect or are compromised.

MODEL DEVELOPMENT

No one particular equation form of a land price model is totally agreed upon by researchers involved in this type of analysis. Yet, it has been suggested that forecasting accuracy of a single equation model is at least as good as that of more comprehensive modeling procedures.[Pope, et. al.]

Earlier work which utilized Federal Land Bank data is strongly relied upon for the research efforts of this project; more specifically, the works by Vollink and Clifton and Spurlock.

The basic model used in this analysis is specified as follows:

$$BLV = f(A, A^2, PC, PP, IRR, UI, FC, T)$$

where:

BLV = bare land transaction value

A = acres transacted

A^2 = acres squared

PC = percent of tract in cultivation

PP = percent of tract in pasture land

IRR = irrigation presence on tract

UI = degree of non-farm influence

FC = FLB designation of farm security class (an income stability assessment)

T = time

This model, as specified above, was chosen on the basis of (1) general economic theory as to the factors that may affect land

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values, and (2) parameters that were found to be significant in previous studies. The relationships between these explanatory variables and the dependent variable should exhibit the expected logical signs for their respective coefficients.

The dependent variable, bare land value, represents the per acre nominal transaction price for a tract of farmland. It does not include the value of any buildings and/or improvements that are on the tract. These can be considered amenity factors and their presence should be utilized in the determination of the value of the land that supports them. It is believed that their presence is reflected in the farm security classification and irrigation presence variables; therefore, they are not included in this analysis as independent variables.

The relationship between the transaction price per acre and the size of tract sold has received much discussion in the analysis of land pricing. Many studies have shown an inverse relationship involving price and acreage. The reasoning is as follows: buyers in the market often must operate within a budget constraint; therefore, limiting the size of tract they may purchase. In addition, a high percentage of farmland purchases are for add-on purposes, suggesting more buyer interest in smaller parcels which may be more compatible with their existing operation. Thus, a price premium is paid for parcellization which, in turn, may cause a tendancy for further parcellization by sellers.

In many of the previous studies the relationship between tract size and price per acre has been shown to exhibit nonlinear characteristics, thus the acres-squared variable is used in this model as a structural factor to aid in the expression of nonlinear

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price/quantity characteristics.

The variable, "percent of tract in cultivation," is expected to exhibit a positive influence on transaction price. In contrast, the "percent of tract in pasture land" variable is hypothesized to reflect a negative relationship with the dependent variable.

The use of irrigation technologies has increased crop production dramatically in recent years. The addition of this technology tends to reduce some uncertainty faced by the producer. A positive relationship is hypothesized between the presence of irrigation capabilities and the transaction price of a sale tract.

The variable "degree of non-farm influence" is included in the model to reflect the impact of the proximity of higher use interests such as residential, industrial, highway, etc. on the sale tract price. Theory expresses that as higher-use influence increases, so should the value of a tract of land; therefore, a positive sign is expected on this coefficient.

"Farm security class" is a site-specific variable measurement. Designated by the FLB appraiser, farm class is used in the model as a proxy indicating long term income producing capability and stability; therefore, a positive coefficient sign is expected.

The final variable to be included in the model is a monthly time trend. It is utilized to pick up speculative trends in the land market as well as inflation adjustments. The coefficient of this variable is expected to be small but positive, in large part, due to the cumulative land value appreciation that occurred in the earlier years of the study period.

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DATA BASE

The data utilized for this analysis of farmland values were provided through the primary data collection efforts of the Federal Land Bank of Omaha. Appraisers at each Land Bank branch office located throughout the state obtained information on all bonafide land sales, made known to them, which occurred within the geographic responsibilities of the office. The FLB's "Farm and Ranch Sale Sheet" was completed for each transaction providing information on location and description of the tract, buildings, loan terms of the transaction, and productivity assessments in relation to a local benchmark.

The data were summarized for each county, each crop reporting district, and the state as a whole. Figure 1 indicates the geographic subdivisions used to segment the study. The crop reporting districts (CRD's) of Nebraska, for the purposes of this report, are identified as follows:

NUMBER	CROP REPORTING DISTRICT
1..........	Southeast
2..........	East Central
3..........	Northeast
4..........	South Central
5..........	Central
6..........	North Central
7..........	Southwest
8..........	Northwest or Panhandle.

Figure 1:   Designation of Crop Reporting Districts in Nebraska.
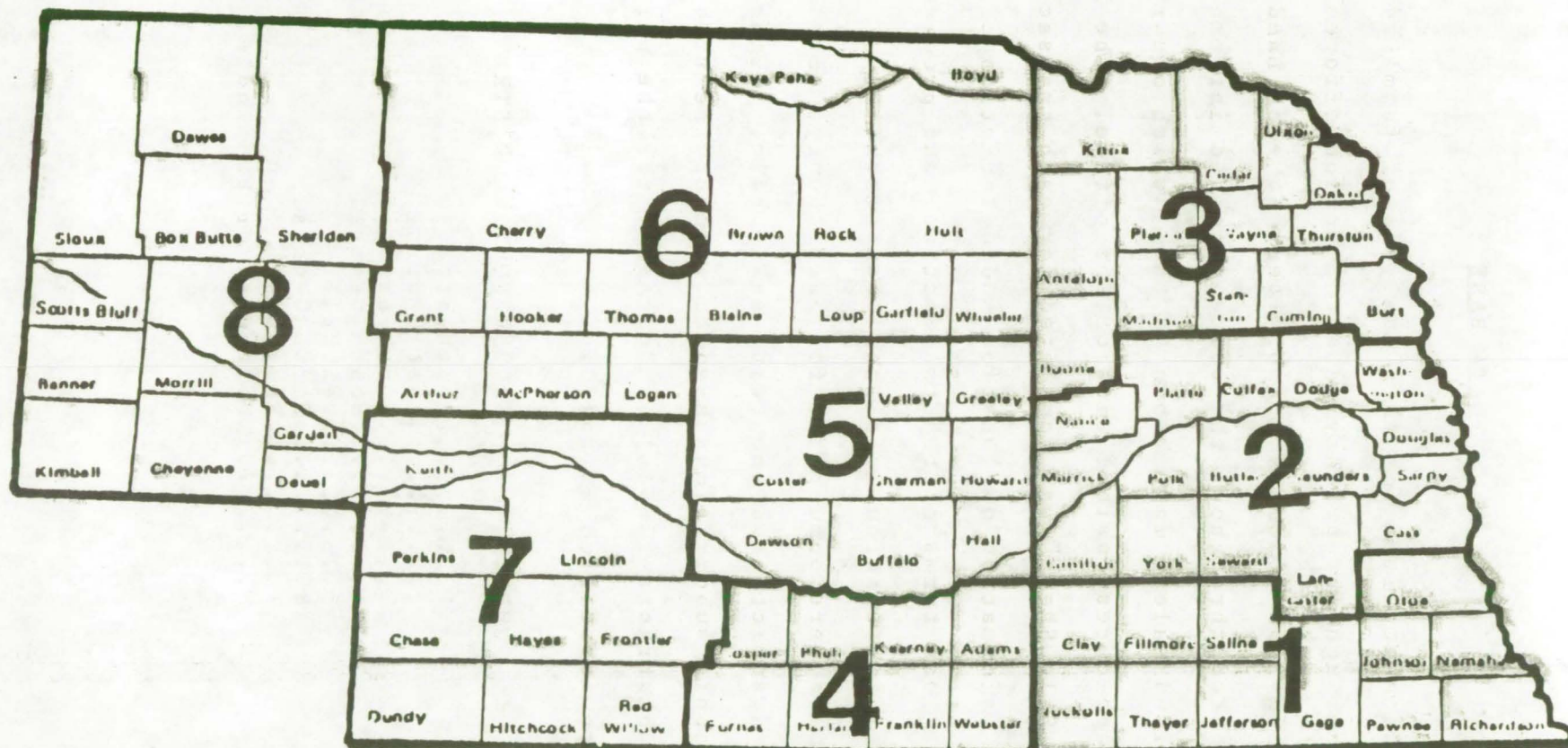
Originally, CRD's were delineated on the basis of relatively homogeneous farming practices and cropping patterns within each of these eight regions. Today, the cropping patterns have changed somewhat, yet, the districts still represent some degree of homogeneity.

SPECIFIC VARIABLE MODIFICATION

Modification of the data for three of the variables was necessary in order to improve the interpretation of the anticipated regression results. The irrigation variable was reported as acres under irrigation. The variable "percent of tract irrigated" was rejected in favor of a dummy variable "irrigation presense" in order to avoid the problem of multi-collinearity with percent of tract in cultivation. It was felt that this would be a logical choice as an indicator of technology presence as well as an indicator of yield stability.

The second variable modified was "farm security class." The reporters' assessment of quality was initially reported as A, B, C, or D representing progressively lower quality levels. This variable was also converted into a zero-one dummy variable. If a tract was reported as Class A or B, the value for the variable was set to 1 and if reported as Class C or D, the value was set equal to 0.

The final variable to be modified was "degree of non-farm influence." Again, the modification entailed changing the original variable values to a dummy variable. Initially reported as integers ranging from zero (none) to three (great degree of non-farm influence), the modified variable took on a value of one for

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reported values of 2 or 3 (moderate or great degree of influence) and zero for reported values of 0 or 1 (none or slight degree of influence).

The use of dummy variables as substitutes for the original variables is believed justified on three counts: 1) using the original values in a regression would imply a continuous range between the reported values, when in fact these variables were reported in discrete units; 2) grouping the lower ratings together and the higher ratings together may reduce the possibility of bias in the reported data base, and; 3) the possibility of multi-collinearity is reduced.

REVIEW OF SELECTED STATISTICS

Table 1 lists the pertinent variables previously described as relevant to the study. A substitute mode of illustration for this data is provided in the Appendix: Variable Summary Maps.

There were 6,931 transactions reported by Nebraska FLB branch offices between January, 1978 and December, 1982. The Northeast CRD had the most transactions over the study period with 1,442. The Panhandle showed the fewest transactions with only 490. On a county by county basis, Lincoln county, in the Southwest district, had the largest number of sales with 218. One county, Grant county in the North Central district, had no reported transactions during the study period. This fact prohibits any subsequent analysis of the specific land market in this county, and further, it can only be assumed that Grant county's market emulates the characteristics of the remaining

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Table 1: Summary Information for Variables Used in Empirical Analysis, By County, By Crop Reporting District, Nebraska 1978-1982.

County and District	Number of Transactions	Average Size of Transaction Acres	Average Price Per Acre Dollars	Average Percent Cultivated	Average Percent Pasture	Percent Reporting Irrigation Present	Percent Reported as Class A or B Farms	Percent Reported with Class 2 or 3 Urban Influence
Clay	83	135	1553	92.0	3.8	36.1	24.1	0.0
Fillmore	98	127	1523	85.3	8.5	32.7	10.2	1.0
Gage	174	145	937	72.5	17.8	7.5	4.6	0.6
Jefferson	93	161	1121	63.6	27.1	11.8	4.3	1.1
Johnson	72	133	755	61.4	31.4	1.4	1.4	0.0
Nemaha	69	117	990	67.1	24.1	0.0	1.4	0.0
Nuckolls	86	145	878	62.2	30.6	17.4	7.0	0.0
Otoe	102	112	1157	79.7	8.7	2.0	2.9	0.0
Pawnee	66	153	664	44.1	45.1	0.0	0.0	0.0
Richardson	93	144	1074	71.2	16.0	0.0	6.5	1.1
Saline	92	119	1297	80.6	13.7	20.7	9.8	1.1
Thayer	91	179	1144	71.6	20.8	26.4	15.4	2.2
SOUTHEAST	1119	139	1098	71.9	19.5	13.1	7.3	0.6
Butler	85	117	1913	83.6	8.3	20.0	45.9	0.0
Cass	64	117	1605	86.7	2.7	0.0	21.9	7.8
Colfax	62	88	1699	81.1	9.8	17.7	19.4	0.0
Dodge	55	109	1950	74.4	6.4	20.0	65.5	3.6
Douglas	34	88	1951	90.7	0.4	0.0	41.2	79.4
Hamilton	96	138	1648	84.3	11.0	66.7	28.1	0.0
Lancaster	102	99	1210	75.1	14.3	0.0	2.9	43.1
Merrick	64	128	1169	69.3	24.5	59.4	9.4	0.0
Nance	48	222	754	58.9	29.9	29.2	0.0	0.0
Platte	79	114	1646	75.8	16.8	27.8	17.7	0.0
Polk	74	109	1586	86.9	8.5	41.9	37.8	0.0
Sarpy	31	90	1972	88.0	1.6	6.5	29.0	90.3
Saunders	119	102	1432	85.6	6.8	9.2	37.0	15.1
Seward	85	111	1490	83.4	10.5	15.3	11.8	0.0
Washington	47	104	1855	63.2	9.8	2.1	46.8	2.1
York	144	112	1706	86.3	7.6	47.2	22.2	0.0
EAST CENTRAL	1189	115	1577	80.5	10.6	25.5	26.1	10.5
Antelope	170	169	784	61.7	20.1	26.5	0.6	0.0
Boone	67	225	931	71.4	23.4	28.4	0.0	0.0
Burt	81	129	1595	83.9	2.9	8.6	56.8	0.0
Cedar	172	148	776	77.1	17.5	11.0	0.0	1.2
Cuming	125	108	1850	79.3	4.5	3.2	72.0	0.8
Dakota	33	154	1147	78.8	11.6	0.0	36.4	0.0
Dixon	102	145	738	76.1	15.2	2.9	2.9	0.0
Knox	156	210	647	59.3	35.9	4.5	0.0	0.6
Madison	132	127	1043	78.8	15.4	10.6	0.0	1.5
Pierce	147	162	896	72.7	19.3	17.7	0.7	0.7
Stanton	88	129	1051	74.4	18.8	3.4	1.1	1.1
Thurston	69	128	1166	86.3	2.3	1.4	21.7	0.0
Wayne	100	130	1028	84.9	7.6	5.0	6.0	0.0
NORTHEAST	1442	152	1005	74.2	16.5	10.6	12.1	0.6
Adams	108	117	1563	83.1	10.8	30.6	32.4	4.6
Franklin	94	192	783	53.6	43.7	23.4	4.3	0.0
Furnas	79	224	582	54.9	39.7	22.8	11.4	2.5
Gosper	55	234	1019	58.8	38.5	40.0	9.1	0.0
Harlan	46	193	918	70.7	23.4	34.8	13.0	6.5
Kearney	79	160	1493	79.9	15.3	51.9	25.3	0.0
Phelps	98	149	1838	84.9	11.4	62.2	30.6	0.0
Webster	107	179	629	54.7	38.3	12.1	0.9	0.0
SOUTH CENTRAL	666	175	1129	68.1	27.1	33.9	16.5	1.5

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Table 1: (Continued)

County and District	Number of Transactions	Average Size of Transaction —Acres—	Average Price Per Acre —Dollars—	Average Percent Cultivated	Average Percent Pasture	Percent Reporting Irrigation Present	Percent Reported as Class A or B Farms	Percent Reported with Class 2 or 3 Urban Influence
Buffalo	182	159	1124	61.4	34.2	39.6	14.3	14.8
Custer	140	398	476	36.7	60.7	30.7	0.7	0.7
Dawson	142	179	1600	71.4	23.3	70.4	38.7	2.1
Greeley	41	248	569	51.9	44.2	24.4	2.4	0.0
Hall	77	122	1757	79.3	14.8	72.7	23.4	1.3
Howard	67	185	814	46.1	47.3	46.3	1.5	0.0
Sherman	62	248	483	40.1	54.1	21.0	1.6	0.0
Valley	50	254	671	45.2	46.7	26.0	2.0	0.0
CENTRAL	761	224	1019	55.8	39.2	44.4	13.7	4.2
Arthur	17	3616	213	12.6	87.0	17.6	11.8	0.0
Blaine	8	1535	176	7.0	92.8	12.5	0.0	0.0
Boyd	35	304	359	47.1	45.2	2.9	0.0	0.0
Brown	36	1017	688	48.8	46.8	63.9	19.4	8.3
Cherry	52	3803	200	14.5	84.3	17.3	7.7	0.0
Garfield	16	590	337	20.2	48.3	6.3	0.0	0.0
Grant	0	—	—	—	—	—	—	—
Holt	154	380	692	54.3	38.8	30.5	4.5	1.3
Hooker	4	3577	145	3.0	96.6	25.0	0.0	0.0
Keya Paha	23	903	254	13.2	85.8	8.7	0.0	8.7
Logan	33	740	515	48.8	48.8	15.2	0.0	0.0
Loup	19	859	500	32.5	59.5	36.8	0.0	5.3
McPherson	13	1885	169	0.4	99.6	0.0	0.0	0.0
Rock	52	492	713	65.1	33.8	71.2	0.0	0.0
Thomas	12	2994	168	1.5	98.3	25.0	0.0	0.0
Wheeler	45	811	577	36.8	57.3	28.9	0.0	2.2
NORTH CENTRAL	519	1127	510	39.9	55.0	29.5	3.9	1.7
Chase	61	383	821	72.7	18.1	60.7	0.0	0.0
Dundy	47	447	539	52.4	42.7	44.7	2.1	2.1
Frontier	64	323	493	47.5	49.1	10.9	0.0	1.6
Hayes	49	426	396	58.6	37.6	14.3	4.1	2.0
Hitchcock	64	317	654	60.5	34.9	31.3	25.0	3.1
Keith	80	300	702	68.3	27.3	30.0	21.3	10.0
Lincoln	218	394	717	46.0	49.1	24.3	12.8	8.3
Perkins	101	264	782	87.3	9.2	40.6	11.9	1.0
Red Willow	61	220	829	60.6	33.1	34.4	21.3	8.2
SOUTHWEST	745	344	685	60.0	35.1	31.0	11.9	5.0
Banner	17	784	370	65.8	28.7	5.9	0.0	5.9
Box Butte	42	324	684	78.4	19.5	40.5	38.1	4.8
Cheyenne	83	289	572	82.5	11.3	1.2	3.6	1.2
Dawes	35	742	344	34.8	62.8	17.1	5.7	17.1
Deuel	36	245	689	87.7	7.8	2.8	30.6	2.8
Garden	21	247	858	84.4	5.0	9.5	19.0	0.0
Kimball	51	419	288	77.8	19.4	3.9	0.0	0.0
Morrill	59	703	565	50.9	44.3	64.4	5.1	0.0
Scotts Bluff	98	179	1307	71.8	18.3	84.7	35.7	2.0
Sheridan	36	1093	448	64.6	30.7	27.8	22.2	0.0
Sioux	12	884	722	57.4	37.8	66.7	0.0	0.0
NORTHWEST	490	452	690	70.3	24.1	34.5	16.7	2.7
NEBRASKA	6931	269	1038	67.9	24.9	24.8	14.0	3.5

North Central district as a whole.

The average transaction value per acre for the 6,931 observations was found to be $1,038 per acre over the sample period. The highest county average, $1,972 per acre, was found in Sarpy county. The East Central district (of which Sarpy county is a part, also containing the Omaha and Lincoln metropolitan areas) was found to exhibit the highest average price among the CRD's of $1,577 per acre. The lowest values were found in the "Sand Hills" rangeland region of the state's North Central district. This CRD averaged $510 per acre over the study period with Hooker county having the lowest per acre value of $145.

The average size of tract sold in the state was 269 acres. The North Central CRD had the largest average transfer size with a mean of 1,127 acres. Four counties in this district had average tract sizes in excess of 2,900 acres sold with Cherry county leading the state with a mean exchange size of 3,803 acres. The smallest tract sizes were found in the East Central district which averaged 115 acres per exchange. Colfax and Douglas counties, both in this CRD, had mean tract sizes of 88 acres per transfer.

The average percent of a tract in cultivation was, as expected, found to be highest in the eastern portion of the state, where row crops dominate the spectrum of agricultural enterprise possibilities. On a statewide basis, the average percent of a tract in cultivation was 67.9% during the study period. The East Central CRD showed the largest mean percent of 80.5% cultivated. The North Central district had the smallest amount with an average of 39.9%.

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The North Central CRD's McPherson county averaged 99.6% of a sold tract in pasture, a figure which was well above the district's average of 55.0% and the state's average of 24.9%. The lowest percent of tract in pasture was found in the East Central district with a mean of 10.6% and values as low as 0.4% in Douglas county.

Irrigation was reported on 24.8% of the tracts sold in the state during the five-year study period. The Central CRD showed the largest proportion of tracts with irrigation in the period with 44.4% reporting its presence. Eight counties had no transactions with irrigation present, while Scotts Bluff county led the state with 84.7% of transactions reporting irrigation presence.

Fourteen percent of the sales in the state were reported as Security Class A or B (excellent or good, respectively) farms. The East Central district demonstrated the largest number of Class A or B farms with 26.1% of the tracts being listed as excellent or good. Twenty-two of the state's counties showed no Class A or B tracts sold during the study period.

The final variable examined was the degree of non-farm influence affecting tracts of land sold. Forty-seven counties reportedly had no urban influence affecting the tracts being transfered. Sarpy, Douglas, and Lancaster counties had the largest exposure to urban influences with 90.3%, 79.4%, and 43.1% respectively, of the exchanges reported as being influenced to a great or moderate degree. Sarpy and Douglas counties are comprised in large portion by the Omaha metropolitan area, while Lancaster County is the location of the state capitol, Lincoln.

The state as a whole exhibited an expected low degree of reaction
to this variable with a figure of only 3.5% of the transactions
being influenced by non-farm market factors.

GENERAL MODEL SPECIFICATION

Parameter estimates were made for each Crop Reporting District (CRD) following the structural form illustrated in Table 2. The variable coefficients were estimated using multiple regression, ordinary least squares procedure. It was assumed that the farmland market within any one CRD was sufficiently different from that of any other CRD such that separate price function parameter estimates were warranted. Thus, these estimates represent an attempt to explain the structural components of land prices (values) considering cross-sectional differences between areas over the study period.

ESTIMATION RESULTS

The results of the estimation process to fulfill Objective 1 are presented in Table 3. The t-ratios are placed below their respective variable coefficient estimates and levels of significance indicated by asterisks (*'s). The calculated F-values, presented at the bottom of each model estimation, exhibit significance at the 99% confidence level for all eight CRD's. The adjusted R^2 measure associated with each model show that the independent variables account for 35 to 67 percent of the variation in the dependent variable. This range in the adjusted R^2 measures is not uncommon, and is, in fact, quite realistic for cross-sectional studies such as this.

Table 2. Specification of General Model - Objective 1.

$$BLV = b_1 + b_2 A + b_3 A^2 + b_4 PC + b_5 PP + b_6 IRR + b_7 UI + b_8 FC + b_9 T + e$$

where:

   BLV = bare land transaction value ($/acre)

     A = acres transacted (acres)

   A^2 = acres transacted squared (acres squared)

    PC = percent of tract in cultivation (decimal equivalents)

    PP = percent of tract in pasture land (decimal equivalents)

   IRR = irrigation presence (values: 1 = yes; 0 = no)

    UI = FLB designation of "Degree of Non-farm Influence"
         (values: 1 = great or moderate; 0 = slight or none)

    FC = FLB designation of "Farm Security Class"
         (values: 1 = class A or B; 0 = class C or D)

     T = time (values: 1 = 1/78, 2 = 2/78,...,60 = 12/82)

   b_1 = intercept

   b_j = variable coefficient estimates, for j = 2 thru 9

     e = a random error term, assumed to be normally distributed
         with mean = 0 and variance = σ^2.

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Table 3: Estimated Per Acre Bare Land Price Functions For Nebraska's Eight Crop Reporting Districts, 1978-1982.

Variable Names	Estimated Variable Coefficients by Crop Reporting District[a/][b/]			
	Southeast	East Central	Northeast	South Central
Intercept	771.18	1690.3	967.74	415.01
	(9.4370)***	(17.4560)***	(12.5420)***	(2.1741)**
Acres	-.82554	-2.1113	-1.1733	-1.6442
	(-3.3738)***	(-6.1843)***	(-4.8084)***	(-3.8204)***
Acres Squared	.00043692	.0014949	.00076227	.0013136
	(1.4653)	(3.2031)***	(2.7466)***	(2.1573)**
Percent Cultivated	498.88	-273.69	-1.9129	814.89
	(6.0757)***	(-2.8401)***	(-.025046)	(4.1700)***
Percent Pasture	-321.94	-995.03	-575.73	19.744
	(-3.7684)***	(-8.7510)***	(-6.6695)***	(.10124)
Irrigation Present	475.20	331.68	238.05	438.92
	(12.997)***	(8.8237)***	(5.1756)***	(10.148)***
Urban Influence	84.964	186.43	493.55	588.90
	(.58062)	(3.6423)***	(2.6806)***	(3.9083)***
Farm Class	424.88	533.78	784.97	417.97
	(9.1264)***	(14.894)***	(18.288)***	(7.7816)***
Time	1.2863	6.0288	6.2902	5.4137
	(1.9023)*	(6.7257)***	(7.6888)***	(4.9744)***
Observations	1119	1189	1442	666
R^2 (adjusted)	.4575	.3586	.3523	.5639
F	118.867	84.041	98.978	108.469

[a/] T-ratios in parentheses.

[b/] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 3: (Continued)

Variable Names	Estimated Variable Coefficients by Crop Reporting District [a/] [b/]			
	Central	North Central	Southwest	Panhandle
Intercept	728.60 (5.3886)***	414.57 (6.7667)***	561.41 (7.2839)***	673.15 (5.7836)***
Acres	-1.3621 (-7.7899)***	-.043392 (-4.8748)***	-.33909 (-6.0414)***	-.049656 (-1.6963)*
Acres Squared	.00060727 (5.4021)***	.0000010616 (3.5234)***	.000069527 (4.9489)***	.00000073487 (0.65917)
Percent Cultivated	329.27 (2.3722)**	242.52 (3.5396)***	-2.8457 (-.036735)	-271.18 (-2.2467)**
Percent Pasture	-170.48 (-1.2505)	-202.10 (-3.2207)***	-288.67 (-3.6795)***	-688.13 (-5.5607)***
Irrigation Present	413.52 (10.2900)***	237.64 (8.5318)***	320.89 (11.712)***	452.10 (12.9990)***
Urban Influence	638.68 (7.6626)***	223.99 (2.6559)***	465.83 (8.0934)***	421.99 (4.1931)***
Farm Class	902.74 (17.564)***	179.22 (3.0315)***	510.62 (13.0850)***	547.36 (12.214)***
Time	3.0795 (3.2780)***	2.7386 (3.8842)***	4.4862 (6.4195)***	4.6852 (4.9547)***
Observations	761	519	745	490
R^2 (adjusted)	.6748	.5565	.5749	.5826
F	198.153	82.262	126.750	86.332

[a/] T-ratios in parentheses.

[b/] Level of significance; *** = 99%, ** = 95%, * = 90%.

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Examination of the estimation results reveals positive and significant intercept terms for all of the CRD models. The intercept term can be interpreted as the "base price" of land, in dollars per acre, within each CRD before inclusion of the effects of the other explanatory variables. In other words, it is felt that the intercept reflects the amortization of the present value of future income streams from production.

The relationship between size of tract and price was negative and significant in all eight CRD's. This demonstrates the inverse relationship common to much of the literature on farmland pricing components. The interpretation of the coefficient may be understood better through the use of an example. The intercept term of the East Central district is $1690.30; this would be reduced by $211 for every 100 acres of tract involved in a transfer. The average size of transaction in that district was 115 acres which would translate to an average reduction of approximately $243 in price per acre, before any of the other variables' influences had been considered.

The sign of the "acres squared" smoothing variable was positive in all CRD's and significant at or above the 95% confidence level in six of the eight districts. The variable was not significant in the Southeast nor Panhandle districts. It may be inferred that the nonlinear relationship between price per acre and size of tract does not necessarily hold true in these two districts. It should be noted that the dollar effect of the smoothing term is minimal for all eight models. For example, the marginal effect of this variable on price per acre in the Southwest district is only 6.9 cents per hundred acres exchanged. As stated

previously in the Model Development section, this variable is more important to improve "model fit" than a factor of value variation.

The "percent of tract in cultivation" variable exhibited positive coefficients and significance at or above the 95% confidence level in four of the eight CRD's. Two of the districts (Northeast and Southwest) exhibited negative signed coefficients but at the same time showed a very low level of significance. The remaining two districts (East Central and Northwest) also showed negative coefficients and were significantly different from zero. There is no direct, theoretical reasoning for the negative signs and the significance of these coefficient estimates. The largest expected effect of the percent cultivated variable was observed in the Southeast district, where the average percent of a tract under cultivation was 71.9%, (see Table 1) which, when used in the specific model for the Southeast CRD, translates to an additional $359 per acre (498.88 x .719 = 358.69), not including the effects of any other variable. In other words, the transaction value per acre in this district is increased by almost five dollars for every one percent increase in the percent of the total tract acreage in cultivation.

The estimated parameters associated with the "percent of tract in pasture land" variable exhibited the expected negative sign in seven of the CRD's and were significantly different from zero at the 99% confidence level in six of these. In only one instance, in the South Central district, did the coefficient display a positive effect on the per acre transaction value. However, the marginal effect of this variable in that CRD was minimal, +$19.74 if the

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tract was 100% pasture land. Also, the t-ratio for this variable in this model was quite low, indicating that the "percent of tract in pasture land" variable was not significantly different from zero in its explanatory power of transaction pricing for the South Central CRD. The largest reduction in transaction price per acre for a CRD occurred in the East Central district, where the average percent of tract in pasture was 10.6% resulting in a -$105.47 adjustment prior to any other consideration of additional factors.

Model estimation provided support to the hypothesized relationship between land value and the presence of irrigation. Transaction values were increased by the presence of irrigation in all eight CRD's, ranging from $237 in the North Central district to $475 in the Southeast district. These coefficients may be interpreted as the capitalization of the increased production capabilities as well as the associated risk reduction of irrigation technology into the value of land.

Non-farm influences, and the resultant provision made in the General Model to indicate the degree of these influences, were found to have a positive effect on transfer price in all of the CRD's. In all but one CRD, the coefficient estimates proved to be significantly different from zero at the 99% confidence level; in the Southeast district, the coefficient was insignificant but still positive. The greatest effect of this factor on the per acre transaction value was experienced in the Central CRD where a great or moderate degree of non-farm influence would result in a positive $638.68 adjustment to the transfer price prior to any other adjustments.

The resulting coefficient estimate for the "farm security class" variable showed a strong positive relationship between it and the price per acre. In all eight CRD's, the level of confidence was 99%, implying, given the FLB's classification scheme, that general income stability as well as quality of the general area and surrounding properties increases the transaction value of a property on the sale block. For example, the value of a tract of land in the Northwest (Panhandle) district could be expected to draw $547.36 more if it were a Class A or B farm than if it were a Class C or D farm.

The final explanatory variable was a monthly time trend. As expected, this variable showed a positive sign in all CRD's and parameter estimates were all significant at or above the 90% level. Taking into account this variable alone, a tract in the Southwest district would sell for $215.34 per acre more in December of 1980 (48 months into the study period) than a "like kind and quality" parcel sold in January, 1978.

SUBREGIONAL MODEL SPECIFICATION

Additional analysis was conducted with respect to the potential for intraregional submarkets. To address the theoretical question as to the geographical scope of the farmland market, further segmentation of the study areas was provided for by reestimating the parameters of the General Model while allowing for individual county variation.

ESTIMATION PROCEDURE

The models for each CRD were altered in the following manner:

$$BLV = b_1 + b_2 A + \ldots + b_9 T + g_1 D_1 + g_2 D_2 + \ldots + g_{p-1} D_{p-1} + e$$

where:

$BLV, b_1, b_2 A$, etc. = original general model specification

$D_1, D_2, \ldots, D_{p-1}$ = dummy variables for the 1st through (p-1)th county in a CRD

$g_1, g_2, \ldots, g_{p-1}$ = coefficient estimate for the 1st through the (p-1)th county dummy variable

p = total number of counties in a CRD

e = a random error term, assumed to be normally distributed with mean = 0 and variance = ; not to be identified with the error term of the previous model.

It is noted that of the "p" counties in a CRD, only "p-1" counties are assigned a dummy variable. For example, the model for the Southeast district, comprised of twelve counties, would

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be specified with eleven county dummy variables (the omitted county designated as the baseline county). This procedure was followed to avoid singularity of the data matrix.

Interpretation of the coefficients on the county dummy variables is similar to the previous section's discussion on Estimation Results. If the estimated intercept is interpreted as a "base price," then the coefficient estimates on these dummy variables can be interpreted as a locational differential in "base price" between the individual counties in a CRD.

In order to test the hypothesis that a more local analysis is necessary to explain farmland values, and therefore meet the underlying assumptions of Objective 2, the "added variables test" was employed. This tests a subgroup of variable coefficients in a model and their "added" explanation of the variance in the dependent variable. In this instance, it is used to test the statistical significance of the explanatory power of the Subregional Model specification, which includes the county dummy variables, over that of the General Model specification for each CRD. Critical values for this statistic follow an F-distribution.

ESTIMATION RESULTS

The results of the estimation process to fulfill Objective 2 are presented in Tables 4.1 - 4.8.

The adjusted R^2 measures increased for all eight CRD models, which indicates that the second model specification better explains the variation in per acre prices than the General Model. However, it does not immediately follow that the subgroups of county dummy

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Table 4.1: Estimated Per Acre Bare Land Price Function For The Southeast Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982 [a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	971.52 (10.567)***	Gage	-290.54 (-5.7146)***
Acres	-.59356 (-2.5103)**	Jefferson	-45.661 (-.79543)
Acres Squared	.00017002 (.59446)	Johnson	-347.03 (-5.6308)***
Percent Cultivated	412.13 (5.1749)***	Nemaha	-157.99 (-2.5465)**
Percent Pasture	-297.72 (-3.6037)***	Nuckolls	-325.69 (-5.5858)***
Irrigation Present	409.83 (11.219)***	Otoe	-120.43 (-2.1448)**
Urban Influence	46.862 (.33513)	Pawnee	-308.76 (-4.7567)***
Farm Class	407.66 (9.0964)***	Richardson	-129.28 (-2.2490)**
Time	1.3344 (2.0123)**	Saline	-75.367 (-1.3396)
Fillmore	78.857 (1.4346)	Thayer	-168.11 (-2.9613)***

N	1119
R^2 (adjusted)	.5089
F	61.985
F (added-variables)	11.547

[a] Baseline County - Clay

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.2: Estimated Per Acre Bare Land Price Function For The East Central Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	1710.3 (11.865)***	Dodge	35.966 (.28251)
Acres	-1.8688 (-5.7077)***	Douglas	-5.2644 (-.042487)
Acres Squared	.0015310 (3.4710)***	Hamilton	-86.238 (-.70835)
Percent Cultivated	-202.73 (-2.1308)**	Lancaster	-371.19 (-3.4560)***
Percent Pasture	-817.55 (-7.3346)***	Merrick	-412.93 (-3.2436)***
Irrigation Present	351.70 (8.8035)***	Nance	-581.47 (-4.3756)***
Urban Influence	275.38 (4.1329)***	Platte	29.209 (.23939)
Farm Class	456.13 (12.623)***	Polk	-181.50 (-1.4729)
Time	5.8770 (6.8442)***	Saunders	-310.14 (-2.7634)***
Butler	164.24 (1.3588)	Seward	-87.161 (-.72268)
Cass	-40.268 (-.33005)	Washington	158.09 (1.2024)
Colfax	51.141 (.40863)	York	-24.650 (-.21162)
N	1189		
R^2 (adjusted)	.4310		
F	40.120		
F (added-variables)	11.010		

[a] Baseline County - Sarpy

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.3: Estimated Per Acre Bare Land Price Function For The Northeast Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	1439.3 (16.199)***	Burt	-193.68 (-2.7343)***
Acres	-.77807 (-3.2513)***	Cedar	-701.05 (-9.7405)***
Acres Squared	.00048397 (1.8144)*	Dakota	-482.30 (-4.8858)***
Percent Cultivated	44.228 (.58631)	Dixon	-728.79 (-9.4563)***
Percent Pasture	-456.88 (-5.3500)***	Knox	-698.98 (-9.3459)***
Irrigation Present	288.77 (6.3362)***	Madison	-449.50 (-6.0190)***
Urban Influence	467.44 (2.6580)***	Pierce	-601.41 (-8.1912)***
Farm Class	391.20 (6.8847)***	Stanton	-433.35 (-5.4189)***
Time	6.2664 (7.9570)***	Thurston	-461.86 (-5.8165)***
Antelope	-729.79 (-10.096)***	Wayne	-528.01 (-6.9051)***
Boone	-573.32 (-6.5148)***		

N   1442

R^2 (adjusted)   .4123

F   51.542

F (added-variables)   13.201

[a] Baseline County - Cuming

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.4: Estimated Per Acre Bare Land Price Function For The South Central Crop
Reporting District Allowing For Individual County Intercept Changes,
1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	1021.8 (6.0392)***	Adams	-174.39 (-3.0785)***
Acres	-.76668 (-2.0902)**	Franklin	-585.73 (-9.8058)***
Acres Squared	.00043486 (.84717)	Furnas	-822.43 (-13.205)***
Percent Cultivated	503.54 (3.0550)***	Gosper	-446.12 (-6.5758)***
Percent Pasture	-103.50 (-.62830)	Harlan	-697.35 (-9.7573)***
Irrigation Present	345.97 (9.2937)***	Kearney	-209.77 (-3.5280)***
Urban Influence	717.12 (5.6419)***	Webster	-741.66 (-12.641)***
Farm Class	298.16 (6.5288)***		
Time	5.7708 (6.2562)***		

N	666
R^2 (adjusted)	.6982
F	103.584
F (added-variables)	42.777

[a] Baseline County - Phelps

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.5: Estimated Per Acre Bare Land Price Function For The Central Crop
Reporting District Allowing For Individual County Intercept Changes,
1978-1982 [a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	1146.8 (8.5018)***	Buffalo	-426.51 (-7.2489)***
Acres	-.97277 (-5.7220)***	Custer	-574.89 (-8.7273)***
Acres Squared	.00042662 (4.0100)***	Dawson	-204.61 (-3.4196)***
Percent Cultivated	306.70 (2.3566)**	Greeley	-625.91 (-7.5145)***
Percent Pasture	-160.12 (-1.2561)	Howard	-460.87 (-6.4354)***
Irrigation Present	335.51 (8.7113)***	Sherman	-638.78 (-8.5650)***
Urban Influence	674.52 (8.3531)***	Valley	-490.70 (-6.2236)***
Farm Class	790.23 (15.688)***		
Time	2.1293 (2.3902)**		

N   761

R^2 (adjusted)   .7183

F   130.198

F (added-variables)   17.616

[a] Baseline County - Hall

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.6: Estimated Per Acre Bare Land Price Function For The North Central Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	390.81 (5.3861)***	Brown	19.899 (.36945)
Acres	-.028107 (-3.0625)***	Cherry	-144.72 (-2.7536)***
Acres Squared	.00000070113 (2.3204)**	Garfield	-81.473 (-1.1266)
Percent Cultivated	238.75 (3.5122)***	Holt	93.446 (2.3442)**
Percent Pasture	-138.03 (-2.1834)**	Hooker	-174.31 (-1.3768)
Irrigation Present	224.48 (7.7961)***	Keya Paha	-110.39 (-1.7457)*
Urban Influence	215.52 (2.6230)***	Logan	-1.8280 (-.033294)
Farm Class	184.75 (3.1596)***	Loup	-6.8768 (-.10570)
Time	2.4044 (3.4420)***	McPherson	-114.23 (-1.4723)
Arthur	-146.90 (-2.0816)**	Thomas	-177.21 (-2.1937)**
Blaine	-148.84 (-1.6054)	Wheeler	65.860 (1.3206)
Boyd	-127.47 (-2.3084)**		

N	519
R^2 (adjusted)	.5977
F	35.983
F (added-variables)	4.737

[a] Baseline County - Rock; no reported transactions for Grant.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.7: Estimated Per Acre Bare Land Price Function For The Southwest Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	525.96 (6.4352)***	Chase	79.180 (1.5377)
Acres	-.30701 (-5.5361)***	Dundy	-87.487 (-1.5520)
Acres Squared	.000062066 (4.4873)***	Frontier	20.869 (.40675)
Percent Cultivated	29.330 (.38497)	Hayes	-146.15 (-2.6651)***
Percent Pasture	-286.67 (-3.7034)***	Hitchcock	-85.239 (-1.6798)*
Irrigation Present	308.73 (11.169) ***	Keith	-61.502 (-1.3052)
Urban Influence	457.35 (8.0974)***	Lincoln	88.781 (2.2314)**
Farm Class	517.09 (13.063)***	Perkins	67.618 (1.3182)
Time	4.4750 (6.4951)***		

N	745
R^2 (adjusted)	.5957
F	69.513
F (added-variables)	4.718

[a] Baseline County - Red Willow

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 4.8: Estimated Per Acre Bare Land Price Function For The Northwest Crop Reporting District Allowing For Individual County Intercept Changes, 1978-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b] [c]	Variable (County) Names (Continued)	Estimated Variable Coefficients[b] [c]
Intercept	975.08 (9.0776)***	Box Butte	-529.46 (-9.0485)***
Acres	-.022541 (-.86733)	Cheyenne	-446.12 (-7.7623)***
Acres Squared	.0000002126 (.21445)	Dawes	-495.65 (-7.3166)***
Percent Cultivated	-74.441 (-.70019)	Deuel	-460.96 (-6.7960)***
Percent Pasture	-523.85 (-4.7154)***	Garden	-279.23 (-3.5414)***
Irrigation Present	221.81 (5.4107)***	Kimbal	-651.85 (-10.485)***
Urban Influence	456.98 (5.0941)***	Morrill	-391.99 (-7.5125)***
Farm Class	497.15 (12.059)***	Sheridan	-584.98 (-9.2640)***
Time	4.0609 (4.8337)***	Sioux	-263.40 (-2.8244)***
Banner	-549.57 (-6.4076)***		

N	490
R^2 (adjusted)	.6862
F	60.403
F (added-variables)	16.475

[a] Baseline County - Scotts Bluff

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

variables are statistically significant additions to each model's estimate. As stated previously, this can be determined only by the use of the added variables test.

The added variables tests for all eight CRD's exhibited significance at the 99% confidence level. This confirms that more geographically specific analysis of farmland pricing components is necessary. Combined with the results of the adjusted R^2 comparisons, these tests lend validity to many of the theoretical underpinnings which prompted interest in this study.

Interpretation of each individual CRD model estimate is identical to that of the General Model, therefore, further discussion of these parameter estimates would be redundant. However, discussion is warranted relative to the remaining county dummy variable parameter estimates.

All coefficient estimates for the county dummy variables in four CRD's (Northeast, South Central, Central, Northwest) exhibited negative signs and were significant at the 99% confidence level. In the remaining four CRD's, levels of significance as well as coefficient sign estimates varied.

In the Southeast district, three county dummy variable parameters (Fillmore, Jefferson, Saline) proved to be insignificant at the 90% confidence level. This implies that these three counties exhibited similar farmland pricing components as observed in Clay County, the baseline county, during the study period. The remaining counties all exhibited negative signs and were significant at or above the 95% confidence level.

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In the East Central district, three of the fourteen county variable coefficient estimates (those for Lancaster, Merrick, Nance, and Saunders Counties) showed negative signs and were significant at the 99% confidence level. The remaining eleven county dummies showed no individual explanatory power at or above the 90% level. This implies that most of the counties in the East Central district had similar bare land pricing characteristics as the baseline (Sarpy County) over the study period as defined by the General Model variables.

In the North Central district, eight counties (Blaine, Brown, Garfield, Hooker, Logan, Loup, McPherson, and Wheeler) were found to have similar bare land pricing characteristics as the baseline, Rock County. Coefficients for three counties (Brown, Holt, and Wheeler) were positive, but only one was significant at or above the 95% confidence level.

The last CRD that showed possibilities of farmland market aggregation beyond the county level was the Southwest. Three of the eight county variable coefficients, those for Hayes, Hitchcock, and Lincoln Counties, showed significance at or above the 90% level, and Lincoln county exhibited a positive coefficient. The remaining counties all exhibited bare land pricing characteristics very similar to those found in the baseline county, Red Willow, judged on the basis of the General Model variables.

It is interesting to note several of the structural changes that occurred in the model estimates when allowing for individual county differences. In four CRD General Model estimates, the coefficients on the "percent of tract under cultiviation" variable were negative. Under the Subregional Model specification, the sign

on this variable became positive in two of the districts (Northeast and Southwest). In the other two, the coefficient on the cultivation variable dropped in its level of significance.

The only other unexpected sign resulting from the General Model estimates occurred on the "percent of tract in pasture" variable in the South Central district. In the Subregional Model estimate, the coefficient estimate changed to the expected negative sign.

COEFFICIENT STABILITY MODEL

The final hypothesis involves the stability of the coefficients estimated in the Subregional Model section. The underlying assumption of Objective 3 is that the advent of farmland value decline may have resulted in a change in the relative influence of the individual factors used in the model. It is important to note that not only have real farmland values declined but since approximately December of 1980, they have also declined in nominal terms.[Johnson and Hanson]

It is not readily apparent which individual factors may have increased or decreased in importance in determining per acre price. One expectation is that the Farm Security Classification variable will have more influence during the downward trending time period. Also, the residual nature of the parameter on the time variable is expected to exhibit a negative sign during the second time period; this in response to the general downward trend in farmland prices. No other speculation regarding the individual variables of the General Model specification is justified.

ESTIMATION PROCEDURE

The model was reestimated breaking up the five year data into two periods of three and two years respectively. Then individual models for the two periods were specified as follows:

Model 1 (January, 1978 to December, 1980)

$$BLV = b_1 + b_2 A + \ldots + b_9 T + g_{11} D + \ldots + g_{p-1} D_{p-1} + e$$

Model 2 (January, 1981 to December, 1982)

$$BLV = c_1 + c_2 A + \ldots + c_9 T + h_{11} D + \ldots + h_{p-1} D_{p-1} + u.$$

The data for these models were specifically separated by grouping observations from January of 1978 to December 1980, and from January 1981 to December 1982. Then to test the validity of the hypothesis that structural changes had occurred in the farmland market, it was necessary to estimate two models for each district; one for each time period. The models are identically specified in the form of the Subregional Model.

Observation of the estimation results may provide for indications of structural changes (a sign change, a change in the level of significance) but not necessarily from a statistically valid standpoint. It is necessary to employ the "Chow-test" in order to statistically test if there have been any structural changes over the two time periods.

The Chow-test is another statistic which has critical values that follow an F-distribution. The Chow-statistic is:

$$\{[SSE_c - (SSE_1 + SSE_2)]/k\}/[(SSE_1 + SSE_2)/(n+m-2k)]$$

where:

   SSE_c = sum of the squared residuals from the model
            estimated for the entire time period

   SSE_1 = sum of the squared residuals from the model
            estimated for the first time period

   SSE_2 = sum of the squared residuals from the model
            estimated for the second time period

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k = number of parameters, including the intercept term, to be estimated by the model

n = number of observations in the first time period

m = number of observations in the second time period.

To interpret the mathematical formulation, the Chow-test compares the unexplained variance of the model for the entire time period to the summation of the unexplained variances from the models for the individual time periods. If the difference is large enough between these two, then the null hypothesis of no structual change is rejected. If the results can be rejected this may imply two things: 1) that the observations from the second time period do not belong to the same population as those from the first, or 2) that the parameter estimates from the first period estimation have changed significantly when reestimated for the second time period.

ESTIMATION RESULTS

Results of the estimation process to fulfill Objective 3 are presented in Tables 5.1 to 5.8. The model estimations for each CRD for the two time periods are placed side by side for comparison of coefficient signs and levels of significance.

The calculated Chow-statistic is presented for each CRD. All Chow-test values exhibited significance at the 99% level except in the Northwest CRD. The calculated value in this CRD did not exhibit significance at the 95% level - typically the lowest level of published critical values - at which the critical value is 1.57.

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Table 5.1: Estimated Per Acre Bare Land Price Functions For The Southeast Crop Reporting District, 1978-1980 and 1981-1982 [a/]

Variable (County) Names	Estimated Variable Coefficients[b/][c/]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	694.93 (5.4057)***	1544.1 (9.6869)***	Gage	-214.45 (-3.1511)***	-325.22 (-4.4886)***
Acres	-.91778 (-3.0251)***	-.45134 (-1.2458)	Jefferson	23.851 (.32094)	-122.98 (-1.4507)
Acres Squared	.00046377 (1.3289)	.00015724 (.31717)	Johnson	-276.53 (-3.6386)***	-404.38 (-3.9705)***
Percent Cultivated	553.39 (4.7200)***	322.75 (3.2985)***	Nemaha	-112.66 (-1.4550)	-147.51 (-1.4980)
Percent Pasture	-123.95 (-1.0435)	-423.02 (-4.0350)***	Nuckolls	-283.40 (-3.3986)***	-361.35 (-4.6151)***
Irrigation Present	523.08 (9.8187)***	269.70 (5.9636)***	Otoe	-75.155 (-.97639)	-140.36 (-1.8094)*
Urban Influence	-92.557 (-.41477)	86.197 (.54166)	Pawnee	-266.91 (-3.0514)***	-269.68 (-2.9869)***
Farm Class	355.93 (5.0473)***	543.79 (10.320) ***	Richardson	-120.71 (-1.6163)	-69.181 (-.82143)
Time	7.6133 (4.9258)***	-8.2705 (-3.7371)***	Saline	160.56 (1.9042)*	-217.85 (-2.9656)***
Fillmore	234.61 (3.1190)***	-109.37 (-1.4433)	Thayer	-90.796 (-1.2524)	-255.62 (-2.9620)***

N	645	474
R^2 (adjusted)	.5108	.5941
F	36.394	37.442
F (Chow-test)	5.054	

[a/] Baseline County - Clay.

[b/] T-ratios in parentheses.

[c/] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 5.2: Estimated Per Acre Bare Land Price Functions For The East Central Crop Reporting District, 1978-1980 and 1981-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b][c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	1624.8 (8.4122)***	2604.7 (9.3265)***	Dodge	51.302 (.28080)	-222.54 (-1.2404)
Acres	-1.8878 (-4.7546)***	-2.4147 (-3.1127)***	Douglas	153.37 (.95810)	-228.27 (-1.1648)
Acres Squared	.0015177 (3.2785)***	.0037569 (1.9431)*	Hamilton	72.834 (.45106)	-477.30 (-2.5212)**
Percent Cultivated	-373.35 (-3.0318)***	63.622 (.42390)	Lancaster	-196.48 (-1.3402)	-680.23 (-4.3419)***
Percent Pasture	-1050.3 (-7.3755)***	-460.81 (-2.5658)**	Merrick	-335.52 (-1.9812)**	-627.67 (-3.2609)***
Irrigation Present	343.88 (6.8260)***	356.64 (5.6805)***	Nance	-503.15 (-2.8701)***	-915.23 (-4.4443)***
Urban Influence	195.51 (2.2978)**	158.15 (1.4660)	Platte	38.351 (.22642)	-130.37 (-.75377)
Farm Class	440.35 (9.5021)***	486.55 (8.5010)***	Polk	10.862 (.065979)	-468.19 (-2.5693)**
Time	14.754 (8.0054)***	-12.331 (-3.5159)***	Saunders	-202.72 (-1.3258)	-612.37 (-3.7473)***
Butler	221.14 (1.3383)	-57.453 (-.32747)	Seward	141.75 (.86151)	-489.52 (-2.8080)***
Cass	-18.603 (-.11124)	-259.11 (-1.4736)	Washington	259.73 (1.5272)	-254.60 (-1.1250)
Colfax	51.329 (.30493)	-43.107 (-.23265)	York	137.46 (.86748)	-347.26 (-2.0376)**

N	697	492
R^2 (adjusted)	.4548	.4431
F	26.244	17.987
F (Chow-test)	3.748	

[a] Baseline County - Sarpy.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 5.3: Estimated Per Acre Bare Land Price Functions For The Northeast Crop Reporting District, 1978-1980 and 1981-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b/c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	1462.2 (12.767)***	1417.0 (8.6482)***	Burt	-237.80 (-2.4462)**	-122.52 (-1.7114)*
Acres	-1.0648 (-3.4648)***	-.71641 (-1.7794)*	Cedar	-697.35 (-7.2887)***	-734.00 (-9.1361)***
Acres Squared	.00067459 (2.1310)**	.0010740 (1.5160)	Dakota	-516.54 (-3.9582)***	-488.31 (-4.4607)***
Percent Cultivated	-39.677 (-.43315)	694.86 (4.8624)***	Dixon	-683.45 (-6.6726)***	-826.51 (-9.7702)***
Percent Pasture	-464.47 (-4.3659)***	137.17 (.93351)	Knox	-659.99 (-6.6461)***	-862.64 (-10.424) ***
Irrigation Present	270.82 (4.2010)***	309.94 (6.8036)***	Madison	-517.39 (-5.2870)***	-337.66 (-3.8927)***
Urban Influence	452.57 (1.6258)	402.63 (2.7087)***	Pierce	-632.92 (-6.5196)***	-657.70 (-7.9968)***
Farm Class	412.63 (5.4389)***	340.68 (5.3910)***	Stanton	-365.31 (-3.4271)***	-671.72 (-7.6785)***
Time	12.172 (6.8722)***	-5.9923 (-2.9484)***	Thurston	-453.36 (-4.2898)***	476.88 (-5.3243)***
Antelope	-757.33 (-7.8071)***	-817.85 (-10.139)***	Wayne	-566.44 (-5.6234)***	-504.10 (-5.8550)***
Boone	-673.41 (-5.3613)***	-523.24 (-5.8610)***			

N	988	454
R^2 (adjusted)	.3518	.6888
F	27.779	51.121
F (Chow-test)	3.158	

[a] Baseline County - Cuming.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 5.4: Estimated Per Acre Bare Land Price Functions For The South Central Crop Reporting District, 1978-1980 and 1981-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b]/[c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	1071.2 (5.8669)***	969.33 (1.7211)*	Adams	-153.34 (-2.1103)**	-111.39 (-1.2850)
Acres	-1.3048 (-2.9928)***	1.6679 (2.1001)**	Franklin	-517.06 (-6.6134)***	-573.49 (-6.4631)***
Acres Squared	.0010469 (1.8275)*	-.0038291 (-2.4766)**	Furnas	-722.66 (-8.9252)***	-831.04 (-8.9444)***
Percent Cultivated	357.03 (2.0938)**	1121.8 (2.1181)**	Gosper	-236.71 (-2.4336)**	-620.48 (-7.0342)***
Percent Pasture	-253.60 (-1.4590)	406.37 (.78657)	Harlan	-534.72 (-5.4877)***	-829.02 (-8.3993)***
Irrigation Present	261.59 (5.7055)***	426.95 (7.2588)***	Kearney	-158.55 (-2.0975)**	-200.44 (-2.2038)**
Urban Influence	803.99 (5.3270)***	400.58 (1.8735)*	Webster	-693.08 (-8.7172)***	-719.41 (-8.8781)***
Farm Class	322.31 (5.4421)***	291.39 (4.3477)***			
Time	12.472 (6.1857)***	-10.508 (-2.8716)***			

N	415	251			
R^2 (adjusted)	.6835	.7648			
F	60.615	55.190			
F (Chow-test)	4.413				

[a] Baseline County - Phelps.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 5.5: Estimated Per Acre Bare Land Price Functions For The Central Crop Reporting District, 1978-1980 and 1981-1982.[a]

Variable (County) Names	Estimated Variable Coefficients[b][c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	1123.4 (7.5209)***	2071.2 (6.7907)***	Buffalo	-602.14 (-8.7516)***	-78.549 (-.81868)
Acres	-.87568 (-4.9499)***	-1.8478 (-3.6766)***	Custer	-730.23 (-9.9125)***	-297.95 (-2.5168)**
Acres Squared	.00037413 (3.5988)***	.0014627 (2.6729)***	Dawson	-403.86 (-5.6728)***	84.892 (.90214)
Percent Cultivated	340.99 (2.4553)**	288.95 (1.1499)	Greeley	-764.63 (-7.9317)***	-287.89 (-2.1109)**
Percent Pasture	-76.457 (-.56132)	-198.84 (-.80070)	Howard	-592.17 (-7.2843)***	-304.79 (-2.4881)**
Irrigation Present	290.27 (6.7205)***	482.19 (6.9429)***	Sherman	-788.71 (-9.1946)***	-278.36 (-2.2617)**
Urban Influence	754.62 (8.0310)***	695.85 (5.2256)***	Valley	-619.20 (-6.9396)***	-208.42 (-1.5170)
Farm Class	763.04 (13.116)***	924.96 (10.862)***			
Time	9.7967 (5.5115)***	-22.253 (-5.9024)***			
N	487	274			
R^2 (adjusted)	.7452	.7532			
F	95.736	56.551			
F (Chow-test)	7.097				

[a] Baseline County - Hall.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

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Table 5.6: Estimated Per Acre Bare Land Price Functions For The North Central Crop Reporting District, 1978-1980 and 1981-1982 [a]

Variable (County) Names	Estimated Variable Coefficients[b][c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	271.54 (3.2614)***	743.05 (1.9021)*	Brown	108.50 (1.6131)	-139.63 (-1.9172)*
Acres	-.028987 (-2.6315)***	-.077439 (-2.4043)**	Cherry	-93.192 (-1.4326)	-101.20 (-1.3651)
Acres Squared	.00000076787 (2.1781)**	.0000064881 (1.7458)*	Garfield	-39.652 (-.46737)	-54.285 (-.43033)
Percent Cultivated	247.76 (3.3896)***	124.64 (.31903)	Holt	141.96 (2.6888)***	53.642 (1.1250)
Percent Pasture	-97.667 (-1.4536)	-279.55 (-.72475)	Hooker	-253.04 (-1.0031)	33.880 (.28777)
Irrigation Present	179.68 (5.0745)***	400.30 (9.9003)***	Keya Paha	-77.669 (-1.0448)	-124.01 (-1.0830)
Urban Influence	243.22 (2.1028)**	230.17 (2.4557)**	Logan	-4.0229 (-.057603)	68.986 (.98512)
Farm Class	77.736 (.91012)	272.92 (4.3850)***	Loup	73.469 (.92742)	-135.29 (-1.3602)
Time	6.9080 (4.9283)***	-3.7458 (-1.6780)*	McPherson	-57.104 (-.49903)	-52.729 (-.65018)
Arthur	-96.880 (-1.1728)	-113.94 (-.91055)	Thomas	-149.53 (-.94990)	-70.792 (-.92082)
Blaine	-98.821 (-.81431)	-43.980 (-.40657)	Wheeler	87.223 (1.4109)	-13.431 (-.15121)
Boyd	-99.629 (-1.5022)	-114.66 (-1.0849)			

N	386	133
R^2 (adjusted)	.5324	.8404
F	20.929	32.585
F (Chow-test)	2.535	

[a] Baseline County - Rock; no reported transactions for Grant.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

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Table 5.7: Estimated Per Acre Bare Land Price Functions For The Southwest Crop Reporting District, 1978-1980 and 1981-1982 [a/]

Variable (County) Names	Estimated Variable Coefficients [b/][c/]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	582.33 (5.9187)***	655.73 (3.5012)***	Chase	82.222 (1.1981)	97.686 (1.2704)
Acres	-.35731 (-5.0828)***	-.23726 (-2.6575)***	Dundy	-127.25 (-1.4729)	-57.398 (-.73620)
Acres Squared	.000066303 (3.8484)***	.000052674 (2.3391)**	Frontier	.14283 (.0022816)	11.311 (.13174)
Percent Cultivated	-43.847 (-.48664)	158.02 (1.1467)	Hayes	-139.00 (-2.0110)**	-132.84 (-1.5235)
Percent Pasture	-262.23 (-2.8112)***	-294.89 (-2.1188)**	Hitchcock	-138.04 (-2.0132)**	-80.789 (-1.0633)
Irrigation Present	259.45 (7.2433)***	351.46 (8.2005)***	Keith	-114.37 (-1.9763)**	15.142 (.19401)
Urban Influence	518.14 (7.9802)***	278.07 (2.5508)**	Lincoln	23.825 (.46395)	141.47 (2.2875)**
Farm Class	476.37 (9.5386)***	575.82 (9.0289)***	Perkins	30.778 (.50577)	43.063 (.44507)
Time	6.9839 (4.6568)***	-1.3445 (-.48861)			

N	425	320			
R^2 (adjusted)	.5636	.6425			
F	35.219	36.830			
F (Chow-test)		2.355			

[a/] Baseline County - Red Willow.

[b/] T-ratios in parentheses.

[c/] Level of significance; *** = 99%, ** = 95%, * = 90%.

Table 5.8: Estimated Per Acre Bare Land Price Functions For The Northwest Crop Reporting District, 1978-1980 and 1981-1982 [a]

Variable (County) Names	Estimated Variable Coefficients [b][c]		Variable (County) Names (Continued)	Estimated Variable Coefficients	
	1978-1980	1981-1982		1978-1980	1981-1982
Intercept	938.30 (8.0414)***	1175.1 (2.3435)***	Box Butte	-537.43 (-7.5863)***	-432.16 (-3.9926)***
Acres	-.032795 (-1.1579)	.023960 (.20497)	Cheyenne	-484.73 (-6.5701)***	-319.54 (-3.0923)***
Acres Squared	.00000056553 (.53097)	-.000000073058 (-.0031042)	Dawes	-483.53 (-5.7894)***	-445.66 (-3.6463)***
Percent Cultivated	-88.074 (-.81958)	-72.371 (-.13969)	Deuel	-481.44 (-5.8487)***	-357.98 (-2.8850)***
Percent Pasture	-459.58 (-3.9369)***	-664.08 (-1.3212)	Garden	-155.91 (-1.4541)	-313.91 (-2.5908)***
Irrigation Present	166.24 (3.2478)***	393.59 (5.3437)***	Kimbal	-640.68 (-8.1115)***	-571.75 (-5.1465)***
Urban Influence	422.68 (4.0165)***	424.53 (2.3283)**	Morrill	-367.61 (-5.9286)***	-474.70 (-4.7525)***
Farm Class	538.16 (10.125)***	418.91 (6.2501)***	Sheridan	-600.54 (-7.6254)***	-488.23 (-4.3974)***
Time	7.0685 (3.8600)***	-1.9165 (-.55965)	Sioux	-189.85 (-1.5124)	-297.99 (-1.9955)**
Banner	-531.38 (-5.0653)***	-540.90 (-3.5088)***			
N	299	191			
R^2 (adjusted)	.6764	.7089			
F	35.598	26.708			
F (Chow-test)	1.496				

[a] Baseline County - Scotts Bluff.

[b] T-ratios in parentheses.

[c] Level of significance; *** = 99%, ** = 95%, * = 90%.

It appears that the underlying assumption of structural change in bare land prices occuring between an upward land pricing market and that of a declining land pricing market is true based on this model specification. It is interesting to note that the calculated Chow-test values are lower in the CRD's (North Central and Southwest) where rangeland and cattle are primary agricultural enterprises. Also, these CRD's exhibited among the highest average acres transacted, which falls in line with these primary industries. This may imply that land prices associated with longer-lived enterprises, such as cattle, are influenced more slowly during downward price adjustments. On the other hand, the value of fixed assets (land) controlled by those entities with short-lived outputs, such as grains, which are typically marketed during the cropping year, may exhibit value decline more rapidly. This seems to explain the higher Chow-test values in the CRD's where grain production is the primary agricultural indu try.

Further indications of structural change in the bare land pricing factors are demonstrated by the results. Comparison of the adjusted R^2 measures shows that change in the explanatory power of the model specification occurred between the two time periods in six of the eight CRD's. This lends additional validity to the hypothesis of structural change between upward and downward agricultural bare land markets.

The sign on the time variable changed from positive to negative in all eight CRD model estimations. Changes in the differential effect of this variable showed divergence in the adjustment in bare land prices from one CRD to another. If the coefficient estimates on the time variable showed little change from one period to the next,

this could be interpreted as meaning that the price adjustment relative to time was similar from one time period to the next. For example, in the Southeast district, the monthly adjustment in price was increasing between seven and eight dollars per acre per month during the upward price trending years (1978 to 1980) and decreasing about eight dollars per acre per month during the downward trending years (1981 to 1982). On the other hand, if the coefficient estimates with respect to the time variable changed greatly, then monthly price adjustment was more severe between the two price trending periods. In the Northeast district, during the upward trend years, per acre price rose about twelve dollars per month, while during the downward trend, price dropped six dollars per month. This fact further reinforces one of the earlier assumptions, under Objective 2, that geographically specific as well as time specific analysis of agricultural land pricing is necessary in order to realistically allow for differences in price adjustment over time.

Hypothetical expectations relative to the Farm Class variable were confirmed in part. Five of the eight CRD's (Southeast, East Central, Central, North Central, and Southwest) showed increased coefficient estimates during the later years. This implies that better tracts of land command higher differential prices than tracts with lower class assessments during the downward land price trends. This indicates that more importance is given to the more stable income producing capabilities of a tract when land prices are dropping.

SUMMARY AND CONCLUSIONS

Primary data, provided by the Federal Land Bank of Omaha, were analyzed to elicit information on the structural characteristics of the Nebraska farmland market for the years 1978 to 1982. Structural indicators were chosen, following current economic logic with respect to the theories of land valuation, to provide for the specification of general land price models for Nebraska's crop reporting districts.

Summary evaluation of the variables examined provided significant insight into the dynamic and heterogeneous land market of this state. Variation in mean values were noted with respect to several characteristics examined. For example, average transaction size ranged from 115 acres per exchange in the East Central district to over 1,100 acres in the North Central district.

Formulation of structural models for the various districts was undertaken. The Ordinary Least Squares regression technique was employed to estimate variable coefficients, the results of which were presented (Table 3). Various statistical tests were presented to document the validity of the models generated. The models' performance was found to be satisfactory with respect to their ability to explain land price variation in Nebraska. With very few exceptions, the individual explanatory variables exhibited the correct signs and were found to be statistically significant. Highly significant F-statistics were found to be

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associated with the models as estimated.

Upon completion of the first study objective, the analysis was extended to examine for intraregional submarkets. The General Models, as previously specified, were modified to allow each indigenous county an individual adjustment for its own local market prices (results in Tables 4.1 through 4.8). It was found that the allowance for subregional variation by county was justified via the added variables test. Additionally, the overall explanatory characteristics of the models tended to improve. Many CRD's exhibited a degree of significance for most, if not all, of the internal counties. Some potential aggregation was found to exist in a few of the districts under study. The most prominent for aggregated characteristics was found to be the North Central district with only three of its fifteen counties showing significant differentiation from the baseline.

The final hypothesis examined the stability of the structural characteristics over time. It was felt that the influence of the models' explanatory characteristics on land price would change as the general economic conditions changed over the study period. To address this hypothesis, the sample period was split into two separate groups reflecting land sales that occurred before and after the advent of land price decline around December, 1980. The variables previously described were then used to reestimate the models for the two time periods (results in Tables 5.1 through 5.8). Subsequently, a statistical test (the Chow-test) was used to examine the stability of the parameters over time. In all but one of the CRD's studied, the hypothesis that a structural change had occurred

between the two time periods exhibited validity, based on the model specification. The Northwest district was determined to be inconclusive, with respect to this examining point, because of the extreme closeness of the calculated Chow-test value and the critical value for rejection of the null hypothesis.

It was felt that future attempts to examine land markets must consider the implications of this report. They are as follows:

1) Many factors can influence the valuation process that is present within a given land market at any specific point in time. Income levels are important; other production, speculation, and amenity characteristics can assist in value elicitation;

2) Attention needs to be paid to the existance of submarkets within regions. The absence of localized differentiation in studies may not only ignore important information but may also reduce the explanatory power of the research effort;

3) The timing of study periods chosen to examine a market may bare strong impact on the parameters generated in a study. Temporal precision is of extreme importance in accurately reflecting the current pressures and forces exerting themselves on the land market.

The conclusions of this study are based on the capacities of the researchers, estimation techniques used herein, and the geographic and time specific nature of the analysis. It is felt that the general conclusions of this research should apply to future, similar efforts. Variations in results of said studies are possible due to differences in the aforementioned factors.

APPENDIX: VARIABLE SUMMARY MAPS

Figure A.1:   Total Number of Reported Transactions, by County, by Crop Reporting District, Nebraska 1978–1982.

23 Keya Paha   35 Boyd

35 Dawes

156 Knox   172 Cedar   Dixon 102   33 Dakota

12 Sioux   42 Box Butte   36 Sheridan   52 Cherry   6   36 Brown   52 Rock   154 Holt   147 Pierce   3   100 Wayne   69 Thurston

170 Antelope

98 Scotts Bluff   59   8   0 Grant   4 Hooker   12 Thomas   8 Blaine   19 Loup   16 Garfield   45 Wheeler   67   132 Madison   88 Stanton   125 Cuming   81 Burt

17 Banner   Morrill   21 Garden   17 Arthur   13 McPherson   33 Logan   50 Valley   41 Greeley   Boone   79 Platte   62 Colfax   55 Dodge   Wash-ington   -- 47

48 Nance

51 Kimball   83 Cheyenne   36 Deuel   80 Keith   140 Custer   5   62 Sherman   67 Howard   64 Merrick   74 Polk   85 Butler   2   119 Saunders   Douglas   -- 34   Sarpy   -- 31

101 Perkins   7   218 Lincoln   142 Dawson   182 Buffalo   77 Hall   96 Hamilton   144 York   85 Seward   102 Lancaster   64 Cass

61 Chase   49 Hayes   64 Frontier   55 Gosper   98 Phelps   79 Kearney   108 Adams   83 Clay   98 Fillmore   92 Saline   1   102 Otoe   72 Johnson   69 Nemaha

47 Dundy   64 Hitchcock   61 Red Willow   79 Furnas   46 Harlan   94 Franklin   107 Webster   86 Nuckolls   91 Thayer   93 Jefferson   174 Gage   66 Pawnee   93 Richardson

Crop Report. Dist.		No.	Crop Report. Dist.		No.
1	Southeast	1119	5	Central	761
2	East Central	1189	6	North Central	519
3	Northeast	1442	7	Southwest	745
4	South Central	666	8	Northwest	490
	State	6931			

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Figure A.2: Average Size of Purchase in Acres, by County, by Crop Reporting District, Nebraska 1978-1982.

742 Dawes			3803 Cherry			903 Keya Paha		304 Boyd			210 Knox	148	Dixon	
884 Sioux	324 Box Butte	1093 Sheridan				1017 Brown	492 Rock	380 Holt		169 Antalope	162 Pierce	130 Wayne 145 Cedar	154 Dakota 128 Thurston	
179 Scotts Bluff	703		-- Grant	3577 Hooker	2994 Thomas	1535 Blaine	859 Loup	590 Garfield	811 Wheeler	225 Boone	127 Madison	129 Stanton 108 Cuming	129 Burt	
784 Banner	Morrill	247	3616 Arthur	1885 McPherson	740 Logan			254 Valley	248 Greeley	222 Nance	114 Platte	88 Colfax	109 Dodge	Wash- ington -- 104
419 Kimball	289 Cheyenne	Garden 245 Deuel	300 Keith			398 Custer		248 Sherman	185 Howard	128 Merrick	109 Polk	117 Butler	102 Saunders	Douglas -- 88 Sarpy -- 90
			264 Perkins	394 Lincoln		179 Dawson		159 Buffalo	122 Hall	138 Hamilton	112 York	111 Seward	99 Lan- caster	117 Cass
			383 Chase	426 Hayes	323 Frontier	234 Gosper	149 Phelps	160 Kearney	117 Adams	135 Clay	127 Fillmore	119 Saline		112 Otoe 133 Johnson 117 Nemaha
			447 Dundy	317 Hitchcock	220 Red Willow	224 Furnas	192 Harlan	192 Franklin	179 Webster	145 Nuckolls	179 Thayer	161 Jefferson	145 Gage	153 Pawnee 144 Richardson

Crop Report. Dist.	No.	Crop Report. Dist.	No.
1 Southeast	139	5 Central	224
2 East Central	115	6 North Central	1127
3 Northeast	152	7 Southwest	344
4 South Central	175	8 Northwest	452
State		269	

Figure A.3: Average Transaction Price Per Bare Land Acre, by County, by Crop Reporting District, Nebraska 1978-1982.

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254 Keya Paha
359 Boyd
344 Dawes
647 Knox
776
Dixon
738
1147 Dakota
200 Cherry
688 Brown
713 Hock
692 Holt
896 Pierce
1028 Wayne
1166 Thurston
722 Sioux
684 Box Butte
448 Sheridan
6
784 Antelope
3
1307 Scotts Bluff
565
8
-- Grant
145 Hooker
168 Thomas
176 Blaine
500 Loup
339 Garfield
577 Wheeler
1043 Madison
1051 Stanton
1850 Cuming
1595 Burt
931
370 Banner
Morrill
858
213 Arthur
169 McPherson
515 Logan
671 Valley
569 Greeley
Boone
1646 Platte
1699 Colfax
1950 Dodge
Washington
1855
754 Nance
288 Kimball
572 Cheyenne
Garden
689 Deuel
702 Keith
5
476 Custer
483 Sherman
814 Howard
1169 Merrick
1586 Polk
1913 Butler
1432 Saunders
Douglas
1951
Sarpy
1972
782 Perkins
717 Lincoln
7
1600 Dawson
1124 Buffalo
1757 Hall
1648 Hamilton
1706 York
1490 Seward
1210 Lancaster
1605 Cass
1157 Otoe
821 Chase
396 Hayes
493 Frontier
1019 Gosper
1838 Phelps
1493 Kearney
1563 Adams
1553 Clay
1523 Fillmore
1297 Saline
1
755 Johnson
990 Nemaha
539 Dundy
654 Hitchcock
829 Red Willow
582 Furnas
918 Harlan
4
783 Franklin
629 Webster
878 Nuckolls
1144 Thayer
1121 Jefferson
937 Gage
664 Pawnee
1074 Richardson

Crop Report. Dist.	No.		Crop Report. Dist.	No.
1	Southeast	1098	5	Central	1019
2	East Central	1577	6	North Central	510
3	Northeast	1005	7	Southwest	685
4	South Central	1129	8	Northwest	690
	State			1038	

Figure A.4: Average Percent of Acres Purchased Reported as Cultivated Crop Land, by County, by Crop Reporting District, Nebraska 1978-1982.
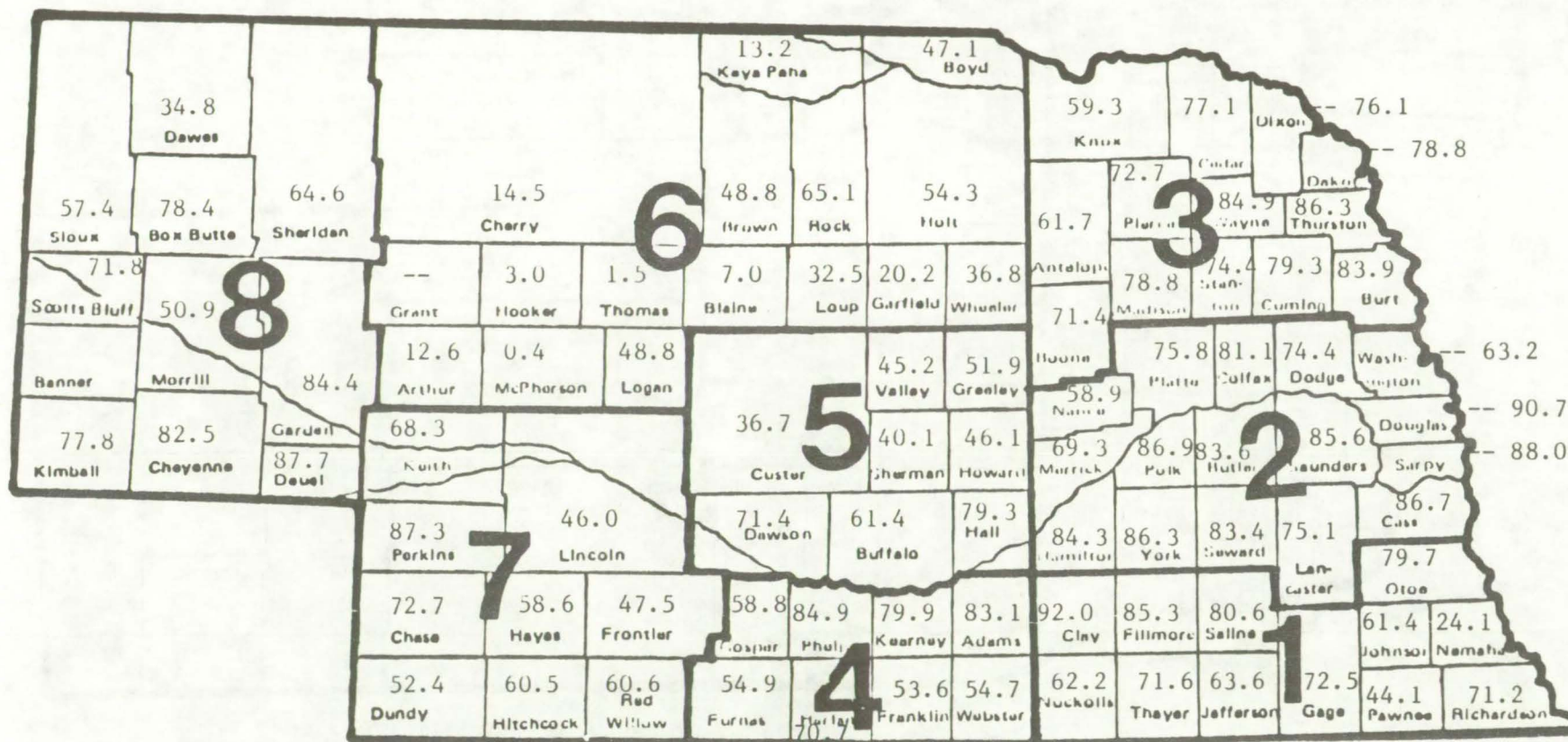
Crop Report. Dist.		No.	Crop Report. Dist.		No.
1	Southeast	71.9	5	Central	55.8
2	East Central	80.5	6	North Central	39.9
3	Northeast	74.2	7	Southwest	60.0
4	South Central	68.1	8	Northwest	70.3
	State				67.9

Figure A.5: Average Percent of Acres Transacted Reported as Pasture Land, by County, by Crop Reporting District, Nebraska 1978-1982.

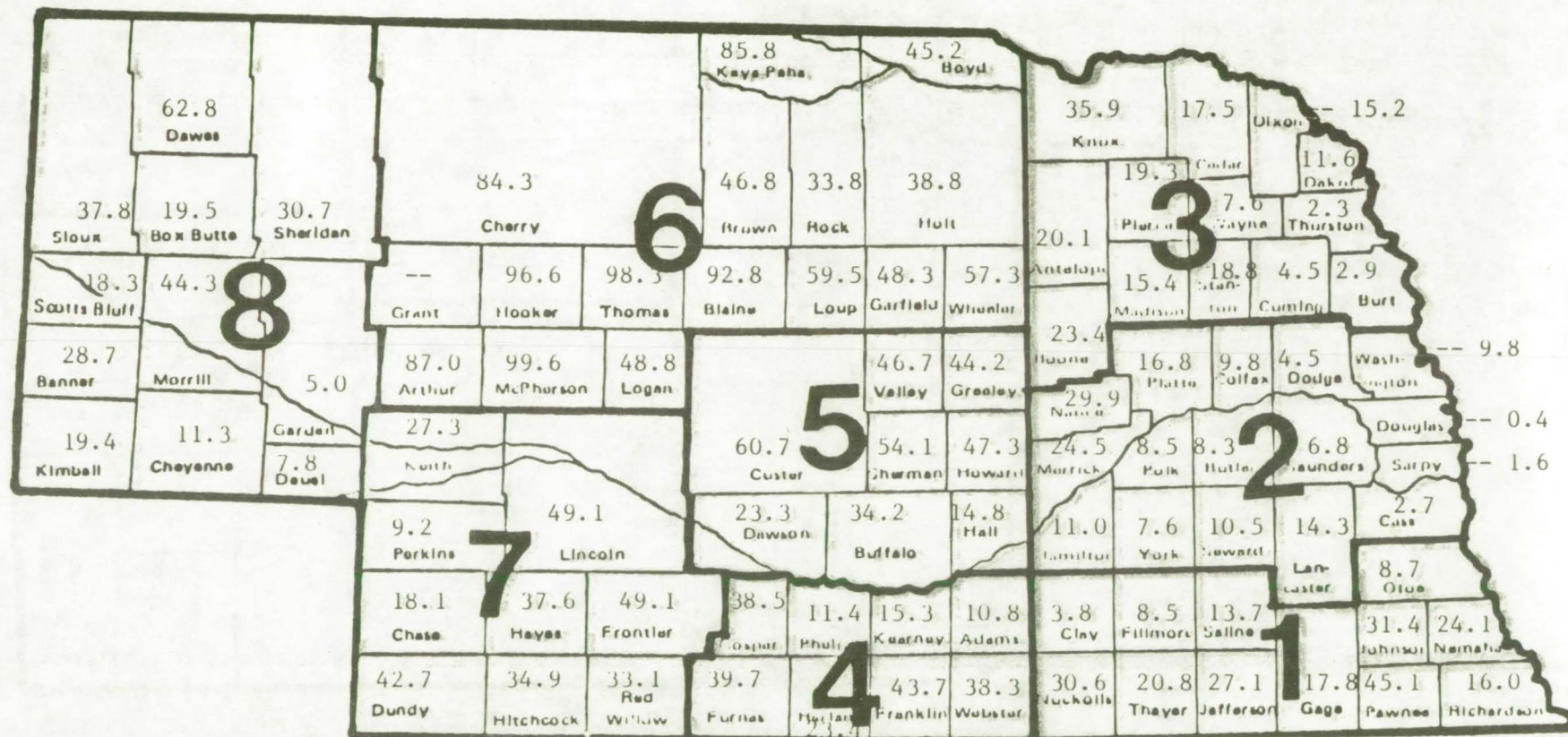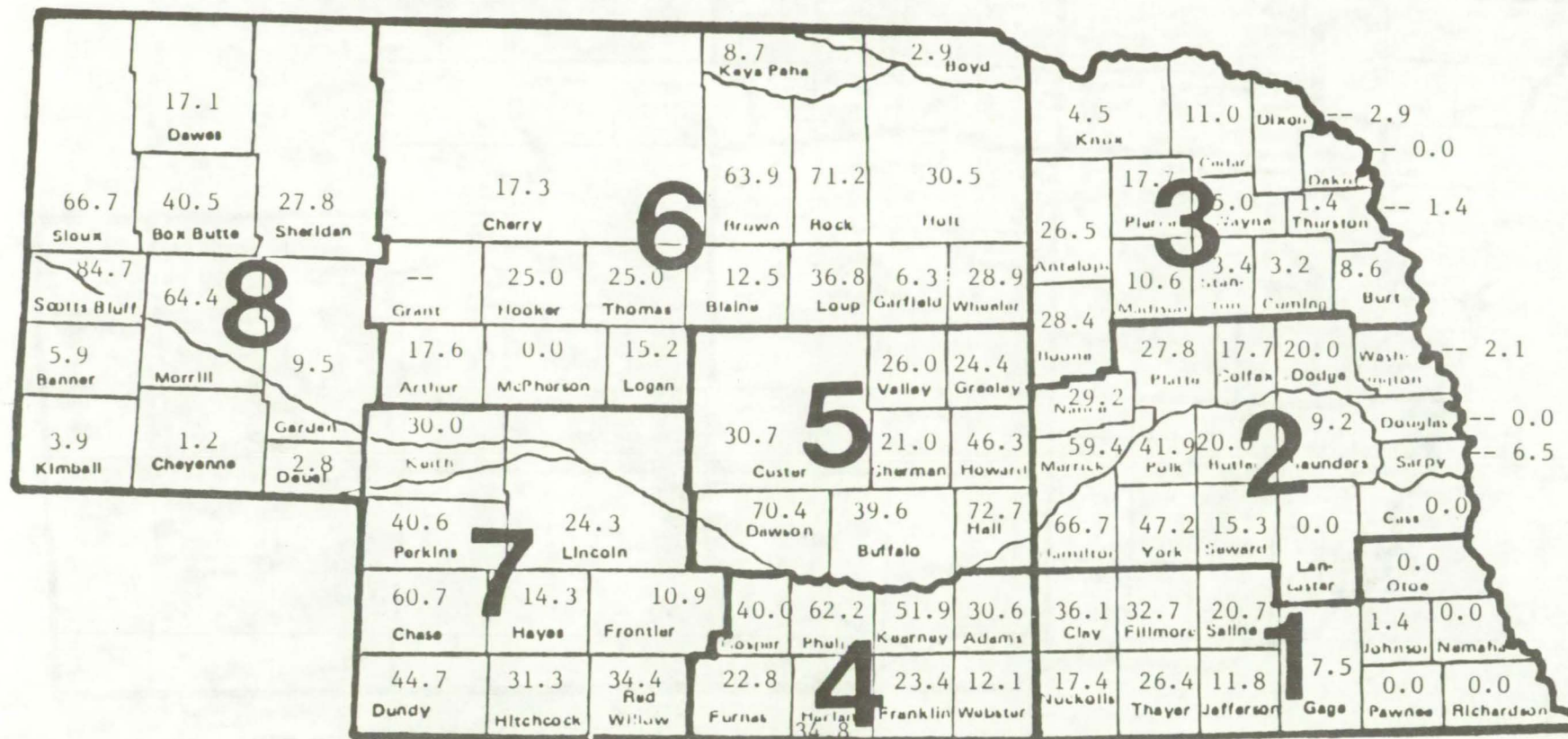| 85.8 Kaya Paha | | 45.2 Boyd | | | | | |
62.8 Dawes			35.9 Knox	17.5 Cedar	Dixon -- 15.2		
	84.3 Cherry	46.8 Brown	33.8 Rock	38.8 Holt	19.3 Pierce	7.6 Wayne	11.6 Dakota / 2.3 Thurston
37.8 Sioux / 19.5 Box Butte / 30.7 Sheridan			20.1 Antelope				
18.3 Scotts Bluff / 44.3 8	-- Grant / 96.6 Hooker / 98.3 Thomas	92.8 Blaine	59.5 Loup / 48.3 Garfield / 57.3 Wheeler	15.4 Madison	18.8 Stanton	4.5 Cuming	2.9 Burt
28.7 Banner / Morrill / 5.0	87.0 Arthur / 99.6 McPherson / 48.8 Logan		46.7 Valley / 44.2 Greeley	23.4 Boone	16.8 Platte / 9.8 Colfax	4.5 Dodge	Wash- ington -- 9.8
19.4 Kimball / 11.3 Cheyenne / Garden / 7.8 Deuel	27.3 Keith	60.7 Custer	54.1 Sherman / 47.3 Howard	29.9 Nance / 24.5 Merrick	8.5 Polk / 8.3 Butler	6.8 Saunders	Douglas -- 0.4 / Sarpy -- 1.6
	9.2 Perkins / 49.1 Lincoln	23.3 Dawson	34.2 Buffalo / 14.8 Hall	11.0 Hamilton	7.6 York / 10.5 Seward	14.3	2.7 Cass
	18.1 Chase / 37.6 Hayes / 49.1 Frontier	38.5 Gosper / 11.4 Phelps / 15.3 Kearney / 10.8 Adams		3.8 Clay / 8.5 Fillmore / 13.7 Saline	Lan- caster	8.7 Otoe	31.4 Johnson / 24.1 Nemaha
42.7 Dundy	34.9 Hitchcock / 33.1 Red Willow	39.7 Furnas / Harlan 23.4 / 43.7 Franklin / 38.3 Webster	30.6 Nuckolls	20.8 Thayer / 27.1 Jefferson	17.8 Gage	45.1 Pawnee	16.0 Richardson

District labels: 6, 3, 8, 5, 2, 7, 4, 1

Crop Report. Dist.	%	Crop Report. Dist.	%
1 Southeast	19.5	5 Central	39.2
2 East Central	10.6	6 North Central	55.0
3 Northeast	16.5	7 Southwest	35.1
4 South Central	27.1	8 Northwest	24.1
State			24.9

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Figure A.6: Percent of Transactions Reported with Irrigation Present, by County, by Crop Reporting District, Nebraska 1978-1982.

17.1 Dawes

8.7 Keya Paha

2.9 Boyd

4.5 Knox

11.0 Dixon

-- 2.9

-- 0.0

66.7 Sioux

40.5 Box Butte

27.8 Sheridan

17.3 Cherry

6

63.9 Brown

71.2 Rock

30.5 Holt

17.7 Cedar

Dakota

1.4 Thurston

-- 1.4

3

26.5 Antelope

5.0 Pierce

Wayne

84.7 Scotts Bluff

64.4

8

-- Grant

25.0 Hooker

25.0 Thomas

12.5 Blaine

36.8 Loup

6.3 Garfield

28.9 Wheeler

10.6 Madison

3.4 Stanton

3.2 Cuming

8.6 Burt

5.9 Banner

Morrill

9.5

17.6 Arthur

0.0 McPherson

15.2 Logan

28.4 Boone

26.0 Valley

24.4 Greeley

27.8 Platte

17.7 Colfax

20.0 Dodge

Washington

-- 2.1

3.9 Kimball

1.2 Cheyenne

Garden

2.8 Deuel

30.0 Keith

5

30.7 Custer

29.2 Nance

21.0 Sherman

46.3 Howard

59.4 Merrick

41.9 Polk

20.6 Butler

2 Saunders

9.2

Douglas

Sarpy

-- 0.0

-- 6.5

40.6 Perkins

7

24.3 Lincoln

70.4 Dawson

39.6 Buffalo

72.7 Hall

66.7 Hamilton

47.2 York

15.3 Seward

0.0 Lancaster

Cass

0.0

60.7 Chase

14.3 Hayes

10.9 Frontier

40.0 Gosper

62.2 Phelps

51.9 Kearney

30.6 Adams

36.1 Clay

32.7 Fillmore

20.7 Saline

1

Otoe

0.0

1.4 Johnson

0.0 Nemaha

7.5

44.7 Dundy

31.3 Hitchcock

34.4 Red Willow

22.8 Furnas

4

34.8 Harlan

23.4 Franklin

12.1 Webster

17.4 Nuckolls

26.4 Thayer

11.8 Jefferson

Gage

0.0 Pawnee

0.0 Richardson

Crop Report. Dist.	No.		Crop Report. Dist.	No.
1	Southeast	13.1	5	Central	44.4
2	East Central	25.5	6	North Central	29.5
3	Northeast	10.6	7	Southwest	31.0
4	South Central	33.9	8	Northwest	34.5

	State			24.8

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Figure A.7: Percent of Transactions Reported as Being Class A or B Farms, by County, by Crop Reporting District, Nebraska 1978-1982.
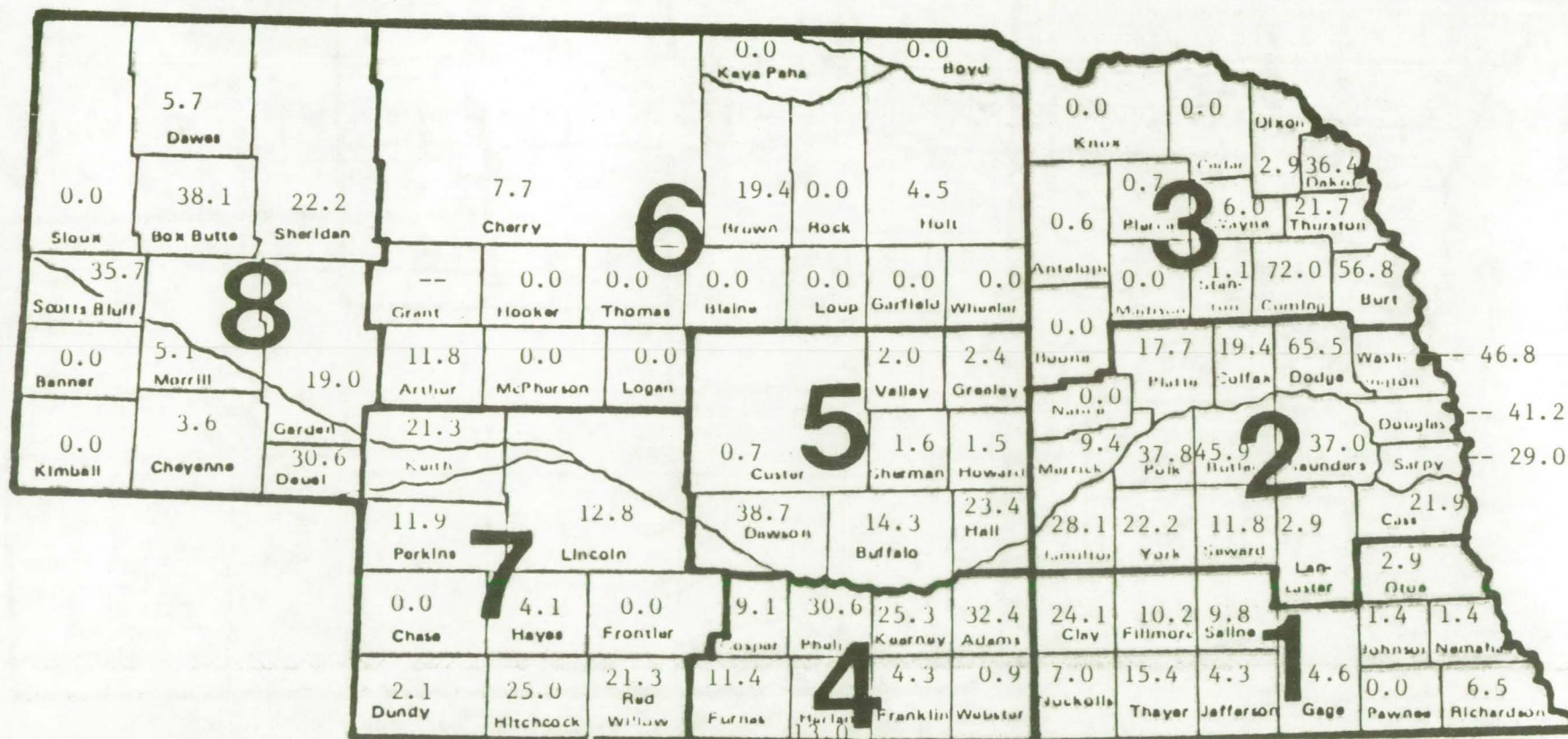
Crop Report. Dist.	No.	Crop Report. Dist.	No.
1 Southeast	7.3	5 Central	13.7
2 East Central	26.1	6 North Central	3.9
3 Northeast	12.1	7 Southwest	11.9
4 South Central	16.5	8 Northwest	16.7
State		14.0	

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Figure A.8: Percent of Transactions Reported as Having a Moderate or Great Degree of Urban Influence, by County, by Crop Reporting District, Nebraska 1978-1982.
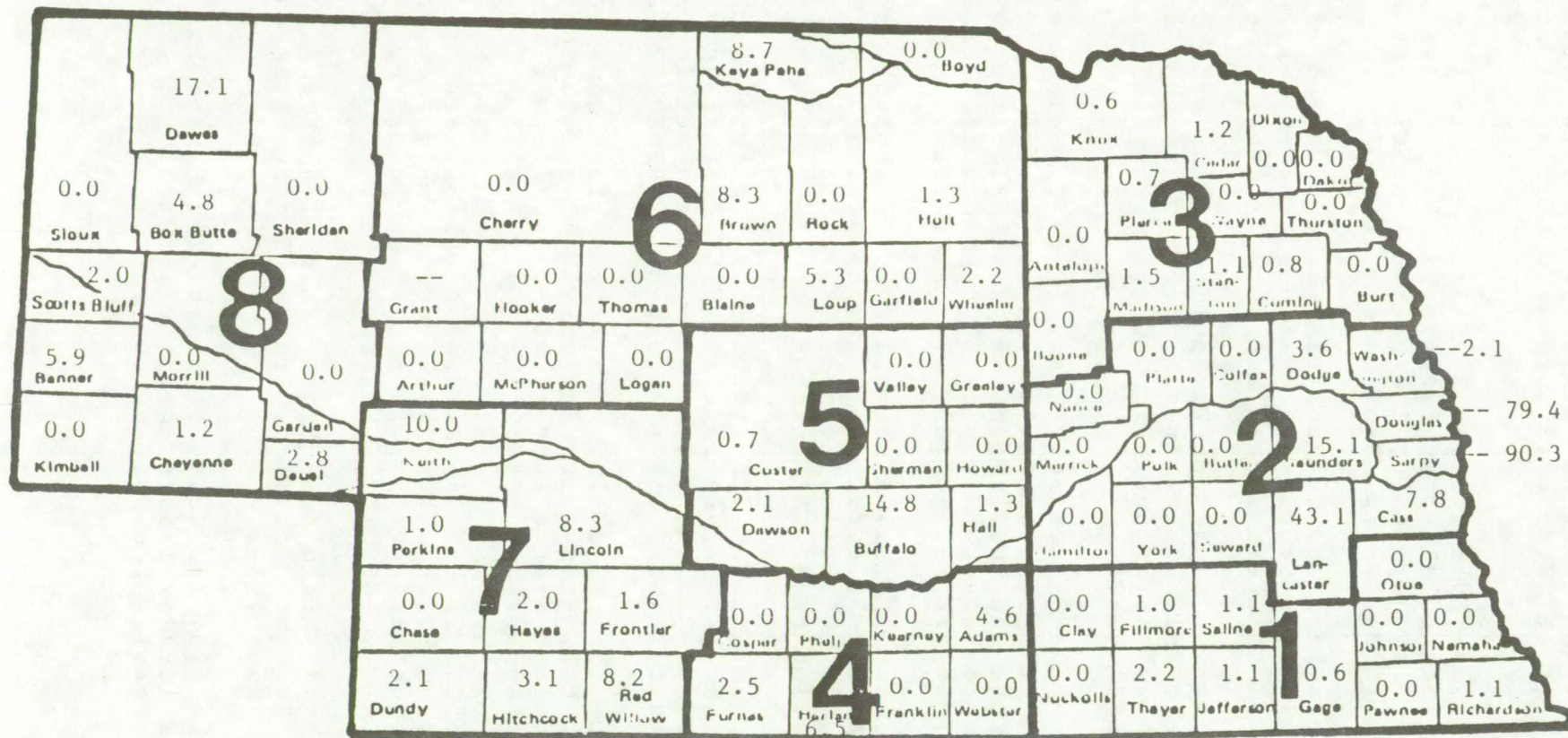
Crop Report. Dist.	No.	Crop Report. Dist.	No.
1 Southeast	0.6	5 Central	4.2
2 East Central	10.5	6 North Central	1.7
3 Northeast	0.6	7 Southwest	5.0
4 South Central	1.5	8 Northwest	2.7
State			3.5

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