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County Level Taxable Agricultural Land Values in North Dakota: Comparing the Gross Revenue Approach with Values Based on Rental Values

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Table of Contents

	<u>Page</u>
List of Tables	ii
List of Figures	iii
Abstract and Keywords	iv
Introduction	1
Overview of North Dakota Agricultural Statistics Service Survey Procedures.	2
Overview of Land Valuation Model	2
Cropland Value	3
Non-Cropland Value	4
Capitalizing Annual Returns	4
Calculated Results	5
Statistical Results	15
Conclusions	22
References	23
Appendix	24

List of Tables

<u>Tables</u>	<u>Page</u>
1. 2000 Value Changes and Percent Changes in Methods for Cropland by County	6
2. 2001 Value Changes and Percent Changes in Methods for Cropland by County	7
3. 2002 Value Changes and Percent Changes in Methods for Cropland by County	8
4. 2000 Value Changes and Percent Changes in Methods for Non-Cropland by County . .	9
5. 2001 Value Changes and Percent Changes in Methods for Non-Cropland County . . .	10
6. 2002 Value Changes and Percent Changes in Methods for Non-Cropland by County .	11
7. Average Rental Rates for Cropland by County	12
8. Average Rental Rates for Non-Cropland by County	13
9. Tax Rates as a Percent of Value by County	14
10. Statistical Results for Cropland Differences	18
11. Statistical Results for Non-Cropland Differences	18

List of Figures

<u>Figures</u>	<u>Page</u>
1. Average Change in Cropland Values by County	16
2. Percentage Change in Cropland Values by County	16
3. Average Change in Non-Cropland Values by County	17
4. Percentage Change in Non-Cropland Values by County	17
5. Cropland Value Scatter Diagram	19
6. Non-Cropland Value Scatter Diagram	19
7. Cropland Differences Scatter Diagram	20
8. Non-Cropland Differences Scatter Diagram	20
9. Cropland and Non-Cropland Differences by Year Scatter Diagram	21

Abstract

Land values calculated with the current North Dakota agricultural land valuation model were compared with values calculated by capitalizing the average cash rent for each county. Results showed there was a significant difference in cropland values, but there was no significant difference in non-cropland values. Land values for the 2000, 2001, and 2002 assessments were compared.

Key Words: land valuation model, property taxes, North Dakota

County Level Taxable Agricultural Land Values in North Dakota: Comparing the Gross Revenue Approach with Values Based on Rental Values

Ronald H. Haugen and Dwight G. Aakre*

Introduction

A comparison of land values estimated by the North Dakota land valuation model and rent capitalization was undertaken at the request of the North Dakota Legislature and the North Dakota State Tax Department. This was part of a broader study to evaluate all taxes in the state.

The North Dakota Legislature has mandated a land valuation model be used to determine agricultural land values for calculating property taxes. The model was developed in the early 1980s as an alternative method for estimating agricultural land values (Laws of North Dakota, 1981, ch. 564). It is similar to a valuation method set forth in 1976 by Congress for establishing the value of agricultural land for federal estate tax purposes (26 U.S.C. §2032A). At that time, Congress was responding to concerns that the rapid increase in agricultural land values would lead to increased estate taxes for landowners and their families, even though the productivity of the land had not increased in the same proportion. The North Dakota model, like the federal provision, bases land values for tax purposes on the revenue generated by the land rather than its market price (Aakre et al., 1997).

The current system of estimating the value of production is cumbersome and difficult to understand. Considerable changes have been made in recent years and more changes are likely. The objective of the current process is to calculate a value for the landowner's share of production equivalent to a share rent, which is then capitalized to derive value. A more direct approach would be to capitalize the value of cash rent received by the landowner. Cash rent is considered an indicator of agricultural lands' current value for production.

The *Doane's Agricultural Report* newsletter dated January 25, 2002, described U.S. land rental trends. According to this report, 57.1 percent of North Dakota farmland is rented and of the rented land, 69.7 percent is cash rent. Clearly the consolidation trend in agriculture is leading to increased renting of farmland. As farm operations become larger, share leases become more of a burden to maintain, meaning cash rent will continue to dominate the rental market.

The North Dakota Agricultural Statistics Service (NDASS) does a very comprehensive land rental survey annually. This survey reports average, most frequent, and the range of rents for both cropland and non-cropland by county.

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This study had two main objectives:

1. To calculate the differences in the present land valuation method and the rent capitalization method.
2. To use statistical methods to determine if differences are significant.

Overview of North Dakota Agricultural Statistics Service Survey Procedures

Data used were from 1989 to present. Each January the NDASS surveys farm operators to obtain land rental and land value by county. Cropland, pasture land, and hay land are indicated in the survey. Approximately 3,000 surveys are mailed out on a random basis to agricultural producers. An agricultural producer is defined as one with agricultural sales of \$1,000 or more. A follow-up phone call is made for surveys not returned. About 2,000 to 2,500 surveys are completed. This is a 66.6 to 83.3 percent response rate. Responses that seem to be out of the range are checked for accuracy. Counties with fewer than five responses are not included.

A simple average is calculated for each county. The more frequently reported rate is also indicated. For purposes of this study, the average rental rate is used. The survey instrument is presented in the Appendix.

This study uses the rental rates from the survey. Land values obtained from the NDASS survey were market values not appropriate for this study. It is important to note that share rents are not used in calculating gross revenues. About 69 percent of the farmland rented in North Dakota is cash rented.

Overview of Land Valuation Model

The land valuation model calculates agricultural land values as the landowner's share of gross returns divided by the capitalization rate.

Landowner's share of gross returns is the portion of revenue generated from the agricultural land that is assumed to be received by the landowner and is expected to reflect current rental rates. The assumption is that the remainder of the revenue from the land is used to pay operating expenses and provide a return for the farm operator's management and risk.

The Legislature has specified that the landowner share of gross returns is 30 percent of gross returns, except for non-cropland (25 percent), sugarbeets and potatoes (20 percent), and irrigated land (50 percent of the dry land rate).

Capitalization rate is an interest rate that reflects the general market rate of interest adjusted for the risk associated with a particular investment or asset (in this case, agricultural land in North Dakota).

The Legislature has specified that the gross federal land bank (AgriBank, FCB) mortgage interest rate for North Dakota be used as the basis for computing the capitalization rate. Capitalizing the income generated by an asset (that is, dividing the annual income by the capitalization rate) is a well-recognized procedure for estimating the value of the asset (Aakre et al., 1997).

Average value of cropland and non-cropland is estimated by the land valuation model independently for each county. The average value of each category is multiplied by the total acres of that category to obtain the total value of all agricultural land in each county. Average value of all agricultural land is determined by dividing the total value of all agricultural land by the total agricultural land acres.

Cropland Value

Using data from the annual summary of the NDASS, the value of production is determined for all crops for which county level acreage and yields are reported. This is accomplished by multiplying harvested acreage, times harvested yields, times the marketing year average price. The price used is the crop reporting district price where applicable. These calculations are made for the most recent 10 years.

Government payment information is obtained from the Farm Service Agency (FSA) for each county. All government payments applicable to crop production are included. These include fixed payments, loan deficiency payments, marketing loan gains, supplemental oilseed payments, market loss assistance payments, and disaster payments. Ten years of payment history are included.

Conservation Reserve Program (CRP) payment information for each county is also obtained from the FSA. The total CRP payments received per county are reduced to one-half before being included in the model.

The value from crop production, government payments, and one-half of the CRP payment are summed by year to determine the annual gross returns from cropland for each county. The landowner share of gross returns by year is determined by summing 20 percent of the revenue from sugarbeets and potatoes, 30 percent of the revenue from all other crops, 30 percent of the revenue from government payments, and all of the CRP revenue (50 percent). This represents the landowner share of gross revenue for cropland for each county. From this 10 years of data, the high and low years are dropped and the remaining eight years are averaged. The total landowner share of gross revenue is divided by a cost of production index to adjust for rising cash input costs. The result is the adjusted landowner share of gross returns.

Adjusted total landowner share of gross returns is divided by the total acres from the above calculations, which includes acres planted, summer fallow, and CRP acres. These represent the acres in each county that accounted for the revenue. The result is the eight-year

average landowner share of gross returns per acre. Total acreage in this calculation does not include acreage devoted to any crops for which individual county data are not available from the NDASS. The assumption is that the average revenue per acre from minor crops not included in the calculation is similar to the average revenue calculated from the major crops for which county data are available.

Non-Cropland Value

The value of production for non-cropland is determined by estimating the value of the beef calf and cull cow production resulting from grazing pasture and rangeland. Acreage of pasture and rangeland in each county was provided by the Natural Resource Conservation Service (NRCS). The average carrying capacity in animal unit months (aum) for pasture and rangeland in each county was estimated by NDSU Animal and Range Science faculty. The productivity assumptions were developed by Animal and Range Science faculty also. These assumptions include: 1) grazing season is assumed to be six months in all counties, 2) one-sixth of the cow herd is assumed to be culled annually, 3) cull cow weight is assumed to be 150 pounds per cow or 25 pounds per month of grazing, 4) calf production is assumed to be 316.5 pounds per cow or 52.75 pounds per month of grazing. All productivity factors are held constant. The only factor that changes for non-cropland is the price of cull cows and calves.

Income per aum from cull cows is calculated by multiplying 0.25 hundredweight times the cull cow price. This price is the marketing year price for cows reported by the NDASS. Income per aum from calves is calculated by multiplying 0.5275 hundredweight times the marketing year calf price reported by the NDASS. Value of production per aum is the sum of cull cow and calf income per aum.

Total aums per county is determined by multiplying the pasture aum factor times the total pasture acres for the county and total rangeland acres for the county times the rangeland aum factor. Total aums per county is multiplied by the value of production per aum to derive the total revenue from non-cropland.

Capitalizing Annual Returns

After the eight-year landowner share of gross returns for cropland and non-cropland have been calculated, these returns are adjusted by dividing by the cost of production index. The cost of production index used is an average of the most recent 10 years after dropping the high and low years. These data are obtained from the Economic Research Service. The adjusted landowner share of gross returns for cropland is divided by the eight-year annual average acres to determine the landowner share of gross returns per acre. The same procedure is used for non-cropland. The resulting values are then divided by the capitalization rate to determine the capitalized average value per acre. A third land category created by recent legislation is inundated land. The Legislature specified the value of inundated land to be 10 percent of the value of non-cropland.

The county directors of tax equalization are surveyed each October to obtain the current acres of cropland, non-cropland, and inundated land on the county abstract. The acreage of each category is multiplied by its respective value, as described above, to obtain the total valuation of agricultural land in the county. The sum value of all three categories is divided by the total acres of cropland, non-cropland, and inundated land supplied by the county director of tax equalization. The result is the average value of all agricultural land in each county.

Calculated Results

Table 1 shows the calculated results for cropland for 2000 for each county. Table 2 shows the calculated results for cropland for 2001 for each county. Table 3 shows the calculated results for cropland for 2002 for each county. Table 4 shows the calculated results for non-cropland for 2000 for each county. Table 5 shows the calculated results for non-cropland for 2001 for each county. Table 6 shows the calculated results for non-cropland for 2002 for each county.

Both dollar change and percentage change are shown in all the tables. Cropland change was generally negative; all counties except McHenry and Billings would have lower value with the rent capitalization method. Non-cropland value with the rent capitalization method would be higher in one-half and lower in one-half of the counties. However, the magnitude of change is less with pasture than with cropland. The percentage differences were calculated to factor out the magnitude of the varying land values throughout North Dakota.

The average rental rates for cropland and non-cropland are shown in Tables 7 and 8, respectively. Tax rates as a percent of value by county are presented in Table 9.

The model capitalization rate for the assessment year was used in the calculation. For 2000, 9.45 was used; for 2001, 9.18 was used; and for 2002, 8.91 was used.

In the calculations for 2000, the cropland and pasture values from the present model were used as the baseline. An Olympic average, or calculated average with the high and low excluded, was used to analyze the data. The Olympic average rent for years 1989 to 1998 (U.S. Department of Agriculture) was divided by the Olympic average percentage tax rate for years 1987 to 1998 for each county (ND State Tax Department) plus the capitalization rate of 9.45 percent.

In the calculations for 2001, the cropland and non-cropland values from the present model were used as the baseline. The Olympic average rent for years 1990 to 1999 (U.S. Department of Agriculture) was divided by the Olympic average percentage tax rate for years 1988 to 1999 for each county (ND State Tax Department) plus the capitalization rate of 9.18 percent.

Table 1. 2000 Value Changes and Percent Changes in Methods for Cropland by County.

COUNTY	2000	2000	Change	% Change
	Cropland Value from Model	Cropland Value from Rent *		
	----- \$			
Adams	197.67	172.98	-24.69	-12.49%
Barnes	397.12	319.51	-77.61	-19.54%
Benson	293.64	245.81	-47.83	-16.29%
Billings	177.07	187.75	10.68	6.03%
Bottineau	298.14	251.26	-46.88	-15.72%
Bowman	195.92	167.40	-28.52	-14.56%
Burke	246.90	224.84	-22.06	-8.94%
Burleigh	227.00	198.45	-28.55	-12.57%
Cass	499.60	489.99	-9.61	-1.92%
Cavalier	353.59	324.36	-29.23	-8.27%
Dickey	375.51	266.23	-109.28	-29.10%
Divide	234.67	211.28	-23.39	-9.97%
Dunn	198.00	171.44	-26.56	-13.41%
Eddy	279.18	263.83	-15.35	-5.50%
Emmons	242.33	209.14	-33.19	-13.70%
Foster	349.17	312.10	-37.07	-10.62%
Golden Valley	221.35	200.68	-20.67	-9.34%
Grand Forks	494.32	456.69	-37.63	-7.61%
Grant	197.21	188.64	-8.57	-4.34%
Griggs	350.10	303.35	-46.75	-13.35%
Hettinger	236.49	211.01	-25.48	-10.77%
Kidder	234.07	196.84	-37.23	-15.91%
LaMoure	377.33	289.55	-87.78	-23.26%
Logan	247.28	212.75	-34.53	-13.96%
McHenry	243.90	247.00	3.10	1.27%
McIntosh	234.84	192.64	-42.20	-17.97%
McKenzie	239.36	198.60	-40.76	-17.03%
McLean	279.28	265.90	-13.38	-4.79%
Mercer	223.81	185.67	-38.14	-17.04%
Morton	224.16	203.48	-20.68	-9.22%
Mountrail	256.61	228.24	-28.37	-11.06%
Nelson	328.13	273.77	-54.36	-16.57%
Oliver	250.91	193.54	-57.37	-22.86%
Pembina	574.45	511.68	-62.77	-10.93%
Pierce	264.43	239.04	-25.39	-9.60%
Ramsey	316.27	271.88	-44.39	-14.03%
Ransom	427.27	348.08	-79.19	-18.53%
Renville	308.25	267.16	-41.09	-13.33%
Richland	552.65	514.56	-38.09	-6.89%
Rolette	278.07	244.33	-33.74	-12.13%
Sargent	441.62	336.25	-105.37	-23.86%
Sheridan	243.51	227.79	-15.72	-6.46%
Sioux	180.58	159.43	-21.15	-11.71%
Slope	211.27	180.38	-30.89	-14.62%
Stark	215.39	187.95	-27.44	-12.74%
Steele	438.28	393.08	-45.20	-10.31%
Stutsman	319.12	290.90	-28.22	-8.84%
Towner	300.63	256.73	-43.90	-14.60%
Traill	553.91	534.27	-19.64	-3.55%
Walsh	533.22	437.56	-95.66	-17.94%
Ward	300.64	279.75	-20.89	-6.95%
Wells	327.08	269.89	-57.19	-17.48%
Williams	208.03	181.13	-26.90	-12.93%

* Avg rent / (cap rate + tax rate)

Table 2. 2001 Value Changes and Percent Changes in Methods for Cropland by County.

COUNTY	2001	2001	Change	% Change
	Cropland Value from Model	Cropland Value from Rent *		
	----- \$ -----			
Adams	203.71	179.19	-24.52	-12.04%
Barnes	409.45	331.01	-78.44	-19.16%
Benson	297.37	256.76	-40.61	-13.66%
Billings	181.07	197.46	16.39	9.05%
Bottineau	302.31	258.94	-43.37	-14.35%
Bowman	203.57	173.81	-29.76	-14.62%
Burke	250.40	235.52	-14.88	-5.94%
Burleigh	238.08	206.49	-31.59	-13.27%
Cass	523.21	503.88	-19.33	-3.70%
Cavalier	375.46	337.02	-38.44	-10.24%
Dickey	389.73	281.10	-108.63	-27.87%
Divide	243.07	220.95	-22.12	-9.10%
Dunn	206.49	178.71	-27.78	-13.46%
Eddy	291.16	272.59	-18.57	-6.38%
Emmons	267.42	218.31	-49.11	-18.36%
Foster	354.43	321.51	-32.92	-9.29%
Golden Valley	228.66	208.22	-20.44	-8.94%
Grand Forks	500.19	468.55	-31.64	-6.33%
Grant	211.24	194.15	-17.09	-8.09%
Griggs	366.44	312.04	-54.40	-14.85%
Hettinger	254.42	220.22	-34.20	-13.44%
Kidder	239.74	202.40	-37.34	-15.57%
LaMoure	381.49	303.10	-78.39	-20.55%
Logan	256.26	220.17	-36.09	-14.09%
McHenry	247.15	258.97	11.82	4.78%
McIntosh	245.70	200.10	-45.60	-18.56%
McKenzie	248.69	204.17	-44.52	-17.90%
McLean	289.20	280.28	-8.92	-3.08%
Mercer	232.87	191.40	-41.47	-17.81%
Morton	239.36	210.43	-28.93	-12.08%
Mountrail	259.90	241.54	-18.36	-7.06%
Nelson	340.15	281.79	-58.36	-17.16%
Oliver	266.91	200.22	-66.69	-24.99%
Pembina	603.45	522.24	-81.21	-13.46%
Pierce	267.89	247.69	-20.20	-7.54%
Ramsey	319.90	280.40	-39.50	-12.35%
Ransom	439.99	361.03	-78.96	-17.95%
Renville	312.44	281.58	-30.86	-9.88%
Richland	574.48	544.05	-30.43	-5.30%
Rolette	282.17	253.01	-29.16	-10.33%
Sargent	461.20	349.35	-111.85	-24.25%
Sheridan	257.45	236.12	-21.33	-8.28%
Sioux	194.94	166.36	-28.58	-14.66%
Slope	222.99	188.85	-34.14	-15.31%
Stark	228.85	195.02	-33.83	-14.78%
Steele	452.36	403.51	-48.85	-10.80%
Stutsman	323.65	300.07	-23.58	-7.29%
Towner	308.69	265.51	-43.18	-13.99%
Traill	572.77	541.82	-30.95	-5.40%
Walsh	553.40	452.23	-101.17	-18.28%
Ward	304.66	292.37	-12.29	-4.03%
Wells	341.60	280.31	-61.29	-17.94%
Williams	219.16	188.71	-30.45	-13.89%

* Avg rent / (cap rate + tax rate)

Table 3. 2002 Value Changes and Percent Changes in Methods for Cropland by County.

COUNTY	2002	2002	Change	% Change
	Cropland Value from Model	Cropland Value from Rent *		
	----- \$			
Adams	222.28	187.03	-35.25	-15.86%
Barnes	427.93	344.70	-83.23	-19.45%
Benson	313.04	267.31	-45.73	-14.61%
Billings	191.59	206.87	15.28	7.98%
Bottineau	318.26	268.55	-49.71	-15.62%
Bowman	217.44	179.69	-37.75	-17.36%
Burke	264.03	246.47	-17.56	-6.65%
Burleigh	251.23	215.34	-35.89	-14.29%
Cass	545.17	517.31	-27.86	-5.11%
Cavalier	395.68	349.71	-45.97	-11.62%
Dickey	418.82	295.78	-123.04	-29.38%
Divide	254.20	231.80	-22.40	-8.81%
Dunn	218.42	186.96	-31.46	-14.41%
Eddy	295.79	281.51	-14.28	-4.83%
Emmons	285.30	227.88	-57.42	-20.12%
Foster	363.96	333.05	-30.91	-8.49%
Golden Valley	236.54	213.59	-22.95	-9.70%
Grand Forks	518.03	476.58	-41.45	-8.00%
Grant	217.67	199.24	-18.43	-8.47%
Griggs	375.28	319.37	-55.91	-14.90%
Hettinger	275.60	230.43	-45.17	-16.39%
Kidder	246.16	209.74	-36.42	-14.80%
LaMoure	412.60	317.59	-95.01	-23.03%
Logan	272.31	227.92	-44.39	-16.30%
McHenry	258.37	274.59	16.22	6.28%
McIntosh	257.66	207.76	-49.90	-19.37%
McKenzie	260.30	213.15	-47.15	-18.12%
McLean	302.28	291.42	-10.86	-3.59%
Mercer	247.03	196.79	-50.24	-20.34%
Morton	257.83	218.15	-39.68	-15.39%
Mountrail	273.25	252.49	-20.76	-7.60%
Nelson	337.14	290.89	-46.25	-13.72%
Oliver	291.62	208.66	-82.96	-28.45%
Pembina	637.26	532.69	-104.57	-16.41%
Pierce	280.72	258.63	-22.09	-7.87%
Ramsey	334.08	290.27	-43.81	-13.11%
Ransom	463.33	372.74	-90.59	-19.55%
Renville	331.80	297.54	-34.26	-10.32%
Richland	607.00	565.44	-41.56	-6.85%
Rolette	298.73	263.61	-35.12	-11.76%
Sargent	492.21	366.22	-125.99	-25.60%
Sheridan	269.81	249.40	-20.41	-7.57%
Sioux	208.32	173.17	-35.15	-16.87%
Slope	230.87	196.55	-34.32	-14.86%
Stark	250.15	203.01	-47.14	-18.85%
Steele	471.11	414.93	-56.18	-11.92%
Stutsman	338.24	311.12	-27.12	-8.02%
Towner	328.38	275.45	-52.93	-16.12%
Traill	599.20	554.60	-44.60	-7.44%
Walsh	582.30	456.04	-126.26	-21.68%
Ward	322.82	307.66	-15.16	-4.69%
Wells	351.89	290.11	-61.78	-17.56%
Williams	232.77	198.16	-34.61	-14.87%

* Avg rent / (cap rate + tax rate)

Table 4. 2000 Value Changes and Percent Changes in Methods for Non-Cropland by County.

COUNTY	2000	2000	Change	% Change
	Non-Cropland Value from Model	Non-Cropland Value from Rent *		
		\$		
Adams	78.21	83.30	5.09	6.50%
Barnes	108.66	97.31	-11.35	-10.44%
Benson	96.20	78.51	-17.69	-18.39%
Billings	73.21	96.84	23.63	32.28%
Bottineau	93.10	86.97	-6.13	-6.58%
Bowman	64.61	71.56	6.95	10.76%
Burke	85.60	66.33	-19.27	-22.52%
Burleigh	85.87	88.10	2.23	2.60%
Cass	110.48	135.36	24.88	22.52%
Cavalier	94.91	85.75	-9.16	-9.65%
Dickey	108.39	114.64	6.25	5.77%
Divide	85.12	65.03	-20.09	-23.60%
Dunn	78.01	88.03	10.02	12.85%
Eddy	96.61	95.10	-1.51	-1.56%
Emmons	85.04	92.86	7.82	9.20%
Foster	92.99	101.97	8.98	9.66%
Golden Valley	64.09	60.62	-3.47	-5.42%
Grand Forks	108.44	89.94	-18.50	-17.06%
Grant	78.41	83.87	5.46	6.96%
Griggs	94.76	95.01	0.25	0.27%
Hettinger	77.82	93.46	15.64	20.10%
Kidder	86.72	95.71	8.99	10.37%
LaMoure	112.10	108.81	-3.29	-2.93%
Logan	85.57	99.17	13.60	15.89%
McHenry	92.48	86.49	-5.99	-6.48%
McIntosh	85.09	102.80	17.71	20.82%
McKenzie	78.33	63.34	-14.99	-19.13%
McLean	85.32	81.88	-3.44	-4.03%
Mercer	77.97	77.58	-0.39	-0.50%
Morton	78.16	86.62	8.46	10.82%
Mountrail	85.00	61.54	-23.46	-27.60%
Nelson	94.25	84.08	-10.17	-10.79%
Oliver	78.39	83.22	4.83	6.16%
Pembina	112.90	103.59	-9.31	-8.24%
Pierce	92.50	81.71	-10.79	-11.66%
Ramsey	96.91	103.57	6.66	6.88%
Ransom	106.76	119.07	12.31	11.53%
Renville	92.77	86.04	-6.73	-7.26%
Richland	109.69	133.67	23.98	21.86%
Rolette	94.09	94.40	0.31	0.33%
Sargent	109.48	121.36	11.88	10.85%
Sheridan	85.08	79.88	-5.20	-6.11%
Sioux	78.22	65.26	-12.96	-16.57%
Slope	71.28	82.06	10.78	15.12%
Stark	78.57	94.54	15.97	20.32%
Steele	96.28	89.17	-7.11	-7.38%
Stutsman	107.08	102.25	-4.83	-4.51%
Towner	96.64	83.03	-13.61	-14.08%
Traill	109.48	109.41	-0.07	-0.07%
Walsh	101.03	92.43	-8.60	-8.51%
Ward	85.00	80.72	-4.28	-5.04%
Wells	93.34	87.40	-5.94	-6.37%
Williams	85.23	55.00	-30.23	-35.46%

* Avg rent / (cap rate + tax rate)

Table 5. 2001 Value Changes and Percent Changes in Methods for Non-Cropland by County.

COUNTY	2001	2001	Change	% Change
	Non-Cropland Value from Model	Non-Cropland Value from Rent *		
	----- \$			
Adams	78.71	85.82	7.11	9.03%
Barnes	109.34	100.21	-9.13	-8.35%
Benson	96.81	81.51	-15.30	-15.81%
Billings	73.68	101.19	27.51	37.34%
Bottineau	93.69	91.25	-2.44	-2.60%
Bowman	65.02	74.64	9.62	14.80%
Burke	86.15	68.49	-17.66	-20.49%
Burleigh	86.41	91.63	5.22	6.04%
Cass	111.18	116.42	5.24	4.72%
Cavalier	95.01	88.43	-6.58	-6.93%
Dickey	109.08	119.95	10.87	9.97%
Divide	85.66	67.62	-18.04	-21.07%
Dunn	78.50	91.71	13.21	16.83%
Eddy	97.22	98.28	1.06	1.09%
Emmons	85.58	96.83	11.25	13.15%
Foster	93.58	105.81	12.23	13.06%
Golden Valley	64.49	64.08	-0.41	-0.64%
Grand Forks	109.13	90.97	-18.16	-16.64%
Grant	78.91	86.75	7.84	9.94%
Griggs	95.36	97.25	1.89	1.98%
Hettinger	78.31	97.56	19.25	24.58%
Kidder	87.27	99.67	12.40	14.21%
LaMoure	112.81	111.99	-0.82	-0.73%
Logan	86.11	102.95	16.84	19.55%
McHenry	93.07	89.47	-3.60	-3.87%
McIntosh	85.63	106.38	20.75	24.23%
McKenzie	78.83	67.44	-11.39	-14.45%
McLean	85.86	85.55	-0.31	-0.37%
Mercer	78.47	80.96	2.49	3.18%
Morton	78.65	90.34	11.69	14.86%
Mountrail	85.54	64.53	-21.01	-24.56%
Nelson	94.84	88.06	-6.78	-7.15%
Oliver	78.89	86.25	7.36	9.33%
Pembina	113.62	112.01	-1.61	-1.42%
Pierce	93.08	84.68	-8.40	-9.02%
Ramsey	97.52	105.12	7.60	7.79%
Ransom	107.44	121.97	14.53	13.53%
Renville	93.35	89.86	-3.49	-3.74%
Richland	110.39	137.80	27.41	24.83%
Rolette	94.69	98.26	3.57	3.77%
Sargent	110.17	126.28	16.11	14.62%
Sheridan	85.62	82.55	-3.07	-3.59%
Sioux	78.72	68.70	-10.02	-12.72%
Slope	71.73	86.76	15.03	20.96%
Stark	79.07	97.91	18.84	23.83%
Steele	96.89	91.07	-5.82	-6.01%
Stutsman	107.76	104.95	-2.81	-2.61%
Towner	97.25	84.89	-12.36	-12.71%
Traill	110.17	41.94	-68.23	-61.94%
Walsh	101.67	95.08	-6.59	-6.48%
Ward	85.53	83.69	-1.84	-2.15%
Wells	93.93	90.58	-3.35	-3.57%
Williams	85.77	57.49	-28.28	-32.97%

* Avg rent / (cap rate + tax rate)

Table 6. 2002 Value Changes and Percent Changes in Methods for Non-Cropland by County.

COUNTY	2002	2002	Change	% Change
	Non-Cropland Value from Model	Non-Cropland Value from Rent *		
	----- \$ -----			
Adams	79.40	89.24	9.84	12.39%
Barnes	110.31	104.25	-6.06	-5.50%
Benson	97.66	84.65	-13.01	-13.33%
Billings	74.33	106.42	32.09	43.18%
Bottineau	94.51	96.34	1.83	1.94%
Bowman	65.59	78.49	12.90	19.67%
Burke	86.91	70.16	-16.75	-19.27%
Burleigh	87.18	95.53	8.35	9.58%
Cass	112.16	136.54	24.38	21.74%
Cavalier	95.85	88.63	-7.22	-7.53%
Dickey	110.04	125.72	15.68	14.25%
Divide	86.41	70.15	-16.26	-18.81%
Dunn	79.20	95.53	16.33	20.62%
Eddy	98.08	100.63	2.55	2.60%
Emmons	86.33	100.48	14.15	16.39%
Foster	94.41	110.02	15.61	16.53%
Golden Valley	65.06	64.95	-0.11	-0.17%
Grand Forks	110.09	95.00	-15.09	-13.70%
Grant	79.61	89.37	9.76	12.26%
Griggs	96.20	98.47	2.27	2.36%
Hettinger	79.00	100.74	21.74	27.52%
Kidder	88.04	103.54	15.50	17.61%
LaMoure	113.80	116.64	2.84	2.50%
Logan	86.87	106.90	20.03	23.06%
McHenry	93.89	93.39	-0.50	-0.54%
McIntosh	86.38	109.86	23.48	27.19%
McKenzie	79.52	71.81	-7.71	-9.70%
McLean	86.62	88.16	1.54	1.77%
Mercer	79.16	83.81	4.65	5.87%
Morton	79.35	93.75	14.40	18.15%
Mountrail	86.29	68.01	-18.28	-21.18%
Nelson	95.68	91.71	-3.97	-4.15%
Oliver	79.58	89.30	9.72	12.22%
Pembina	114.62	111.95	-2.67	-2.33%
Pierce	93.90	88.10	-5.80	-6.17%
Ramsey	98.38	107.79	9.41	9.57%
Ransom	108.38	125.59	17.21	15.88%
Renville	94.18	94.24	0.06	0.06%
Richland	111.36	143.83	32.47	29.16%
Rolette	95.52	101.21	5.69	5.95%
Sargent	111.14	133.07	21.93	19.73%
Sheridan	86.37	85.66	-0.71	-0.82%
Sioux	79.41	71.78	-7.63	-9.61%
Slope	72.36	91.17	18.81	26.00%
Stark	79.76	101.27	21.51	26.97%
Steele	97.74	93.34	-4.40	-4.51%
Stutsman	108.71	109.12	0.41	0.38%
Towner	98.11	88.91	-9.20	-9.38%
Traill	111.14	114.47	3.33	2.99%
Walsh	102.57	98.22	-4.35	-4.24%
Ward	86.29	87.40	1.11	1.29%
Wells	94.76	94.14	-0.62	-0.65%
Williams	86.53	60.32	-26.21	-30.29%

* Avg rent / (cap rate + tax rate)

Table 7. Average Rental Rates for Cropland by County.

COUNTY	Average	Average	Average
	Rent	Rent	Rent
	89-98	90-99	91-00
	----- \$ -----		
Adams	19.29	19.55	19.94
Barnes	35.05	35.55	36.13
Benson	27.16	27.53	27.99
Billings	18.59	19.08	19.49
Bottineau	27.34	27.53	27.88
Bowman	18.01	18.25	18.40
Burke	24.24	24.80	25.34
Burleigh	21.51	21.89	22.29
Cass	53.21	53.61	53.80
Cavalier	35.23	35.83	36.30
Dickey	28.91	29.94	30.85
Divide	22.99	23.49	24.04
Dunn	18.55	18.93	19.35
Eddy	29.34	29.71	30.04
Emmons	22.78	23.25	23.70
Foster	34.05	34.34	34.74
Golden Valley	21.98	22.30	22.36
Grand Forks	49.83	50.09	49.85
Grant	20.64	20.81	20.90
Griggs	33.76	34.01	34.01
Hettinger	23.00	23.48	23.99
Kidder	21.34	21.48	21.75
LaMoure	31.30	32.04	32.78
Logan	23.06	23.34	23.61
McHenry	26.78	27.43	28.34
McIntosh	20.61	20.95	21.28
McKenzie	20.58	20.66	21.04
McLean	28.21	29.04	29.46
Mercer	20.31	20.54	20.66
Morton	22.20	22.54	22.86
Mountrail	25.18	26.06	26.64
Nelson	30.53	30.80	31.13
Oliver	20.61	20.86	21.26
Pembina	55.88	55.78	55.61
Pierce	26.44	26.80	27.34
Ramsey	29.66	29.98	30.36
Ransom	38.15	38.78	39.21
Renville	28.80	29.65	30.59
Richland	57.89	58.98	60.05
Rolette	26.95	27.33	27.84
Sargent	36.99	37.63	38.56
Sheridan	24.74	25.10	25.91
Sioux	17.71	18.10	18.43
Slope	18.85	19.26	19.54
Stark	20.90	21.24	21.60
Steele	43.48	43.70	43.90
Stutsman	31.65	31.99	32.33
Towner	28.14	28.46	28.81
Trail	59.25	58.79	58.79
Walsh	48.70	48.75	48.11
Ward	30.33	30.96	31.81
Wells	29.34	29.83	30.20
Williams	20.09	20.48	21.03

Table 8. Average Rental Rates for Non-Cropland by County.

COUNTY	Average	Average	Average
	Rent	Rent	Rent
	89-98	90-99	91-00
	----- \$ -----		
Adams	9.29	9.36	9.51
Barnes	10.68	10.76	10.93
Benson	8.68	8.74	8.86
Billings	9.59	9.78	10.03
Bottineau	9.46	9.70	10.00
Bowman	7.70	7.84	8.04
Burke	7.15	7.21	7.21
Burleigh	9.55	9.71	9.89
Cass	14.70	14.16	14.20
Cavalier	9.31	9.40	9.20
Dickey	12.45	12.78	13.11
Divide	7.08	7.19	7.28
Dunn	9.53	9.71	9.89
Eddy	10.58	10.71	10.74
Emmons	10.11	10.31	10.45
Foster	11.13	11.30	11.48
Golden Valley	6.64	6.86	6.80
Grand Forks	9.81	9.73	9.94
Grant	9.18	9.30	9.38
Griggs	10.58	10.60	10.49
Hettinger	10.19	10.40	10.49
Kidder	10.38	10.58	10.74
LaMoure	11.76	11.84	12.04
Logan	10.75	10.91	11.08
McHenry	9.38	9.48	9.64
McIntosh	11.00	11.14	11.25
McKenzie	6.56	6.83	7.09
McLean	8.69	8.86	8.91
Mercer	8.49	8.69	8.80
Morton	9.45	9.68	9.83
Mountrail	6.79	6.96	7.18
Nelson	9.38	9.63	9.81
Oliver	8.86	8.99	9.10
Pembina	11.31	11.96	11.69
Pierce	9.04	9.16	9.31
Ramsey	11.30	11.24	11.28
Ransom	13.05	13.10	13.21
Renville	9.28	9.46	9.69
Richland	15.04	14.94	15.28
Rolette	10.41	10.61	10.69
Sargent	13.35	13.60	14.01
Sheridan	8.68	8.78	8.90
Sioux	7.25	7.48	7.64
Slope	8.58	8.85	9.06
Stark	10.51	10.66	10.78
Steele	9.86	9.86	9.88
Stutsman	11.13	11.19	11.34
Towner	9.10	9.10	9.30
Traill	12.13	12.13	12.13
Walsh	10.29	10.25	10.36
Ward	8.75	8.86	9.04
Wells	9.50	9.64	9.80
Williams	6.10	6.24	6.40

Table 9. Tax Rates as a Percent of Value by County.

COUNTY	2000 Effect	2001 Effect	2002 Effect
	Tax Rate	Tax Rate	Tax Rate
	As Percent	As Percent	As Percent
	87-98	88-99	91-00
Adams	0.0170	0.0173	0.0175
Barnes	0.0152	0.0156	0.0157
Benson	0.0160	0.0154	0.0156
Billings	0.0045	0.0048	0.0051
Bottineau	0.0143	0.0145	0.0147
Bowman	0.0131	0.0132	0.0133
Burke	0.0133	0.0135	0.0137
Burleigh	0.0139	0.0142	0.0144
Cass	0.0141	0.0146	0.0149
Cavalier	0.0141	0.0145	0.0147
Dickey	0.0141	0.0147	0.0152
Divide	0.0143	0.0145	0.0146
Dunn	0.0137	0.0141	0.0144
Eddy	0.0167	0.0172	0.0176
Emmons	0.0144	0.0147	0.0149
Foster	0.0146	0.0150	0.0152
Golden Valley	0.0150	0.0153	0.0156
Grand Forks	0.0146	0.0151	0.0155
Grant	0.0149	0.0154	0.0158
Griggs	0.0168	0.0172	0.0174
Hettinger	0.0145	0.0148	0.0150
Kidder	0.0139	0.0143	0.0146
LaMoure	0.0136	0.0139	0.0141
Logan	0.0139	0.0142	0.0145
McHenry	0.0139	0.0141	0.0141
McIntosh	0.0125	0.0129	0.0133
McKenzie	0.0091	0.0094	0.0096
McLean	0.0116	0.0118	0.0120
Mercer	0.0149	0.0155	0.0159
Morton	0.0146	0.0153	0.0157
Mountrail	0.0158	0.0161	0.0164
Nelson	0.0170	0.0175	0.0179
Oliver	0.0120	0.0124	0.0128
Pembina	0.0147	0.0150	0.0153
Pierce	0.0161	0.0164	0.0166
Ramsey	0.0146	0.0151	0.0155
Ransom	0.0151	0.0156	0.0161
Renville	0.0133	0.0135	0.0137
Richland	0.0180	0.0166	0.0171
Rolette	0.0158	0.0162	0.0165
Sargent	0.0155	0.0159	0.0162
Sheridan	0.0141	0.0145	0.0148
Sioux	0.0166	0.0170	0.0173
Slope	0.0100	0.0102	0.0103
Stark	0.0167	0.0171	0.0173
Steele	0.0161	0.0165	0.0167
Stutsman	0.0143	0.0148	0.0148
Towner	0.0151	0.0154	0.0155
Traill	0.0164	0.0167	0.0169
Walsh	0.0168	0.0160	0.0164
Ward	0.0139	0.0141	0.0143
Wells	0.0142	0.0146	0.0150
Williams	0.0164	0.0167	0.0170

In the calculations for 2002, the cropland and pasture values from the present model were used as the baseline. The Olympic average rent for years 1991 to 2000 (U.S. Department of Agriculture) was divided by the Olympic average percentage tax rate for years 1989 to 2000 for each county (ND State Tax Department) plus the capitalization rate of 8.91 percent.

Additional analysis was done to evaluate percentage change in values for each county within the state. The same procedure was used with the current model of averaging the most recent 10 years after dropping the high and low years. The average rent derived from this process was capitalized by the same rate used in the model for that year. Availability of land rent data limited the analysis to three years which were the values calculated for the 2000, 2001, and 2002 assessments. The results shown are an average of these three years. Figure 1 shows cropland average value changes for each county. Figure 2 shows cropland percentage changes for each county. Figure 3 shows non-cropland average value changes for each county. Figure 4 shows non-cropland percentage changes for each county.

Using the land rent procedure resulted in lower values for cropland for all but two counties. Only McHenry and Billings Counties showed higher cropland values. The other extreme included Sargent, Dickey, and Walsh Counties with values more than \$100 per acre less than the current system. Results for non-cropland split the state in half. Twenty-six counties would have lower land values with Williams County declining by over \$28 per acre or about 33 percent. Twenty-seven counties would have higher values. The largest increase would be Richland County at about \$28 while Billings County would have the largest percentage increase of over 37 percent.

The results are inconclusive but suggest it may be difficult to make the change to using cash rents in lieu of calculating the value of production. On the other hand, it is hard to argue that cash rent is not a good indicator of the landowner's return. This raises the issue of which method does a better job of capturing the intent of the legislation. Should the Legislature choose to adopt capitalization of cash rents as the method of valuing land, the authors recommend a phase-in procedure.

Statistical Results

Statistical analysis was used to determine if land valuations calculated by the current model were significantly different from land valuations calculated using rent. Both cropland and non-cropland values were compared. The null and alternative hypothesis are shown below:

null hypothesis: $H_0 : \mu = 0$

alternative hypothesis: $H_a : \mu \neq 0$

where μ_1 = the mean percentage difference for each value.

Average Change in Cropland Values Using A Capitalized Cash Rent Approach

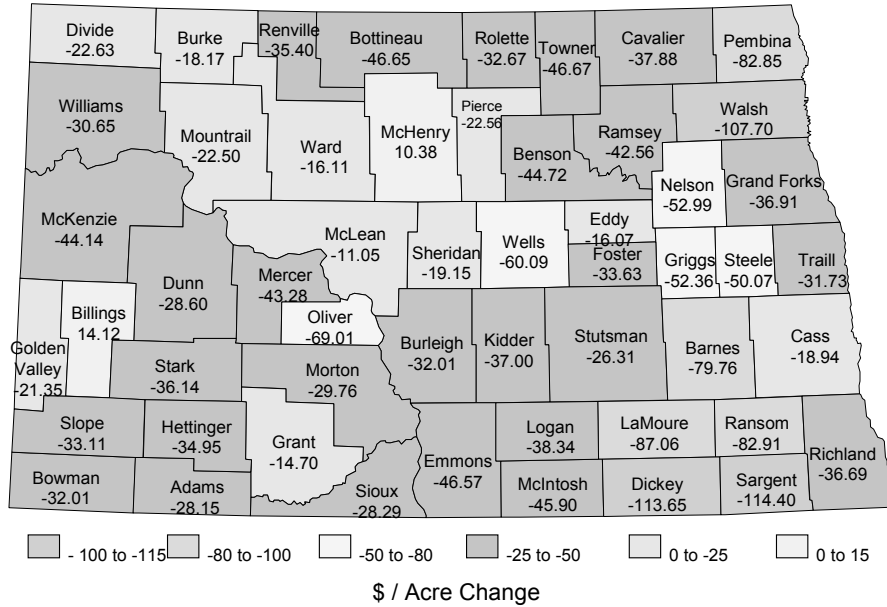


Figure 1. Average Change in Cropland Values by County

Percentage Change in Cropland Values Using A Capitalized Cash Rent Approach

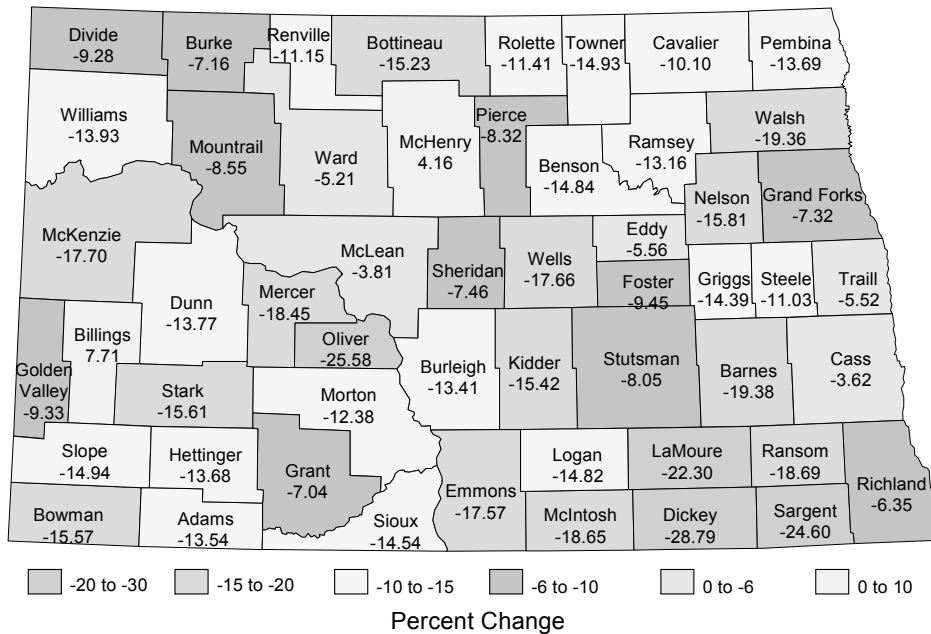


Figure 2. Percentage Change in Cropland Values by County

Average Change in Non-Cropland Values Using A Capitalized Cash Rent Approach

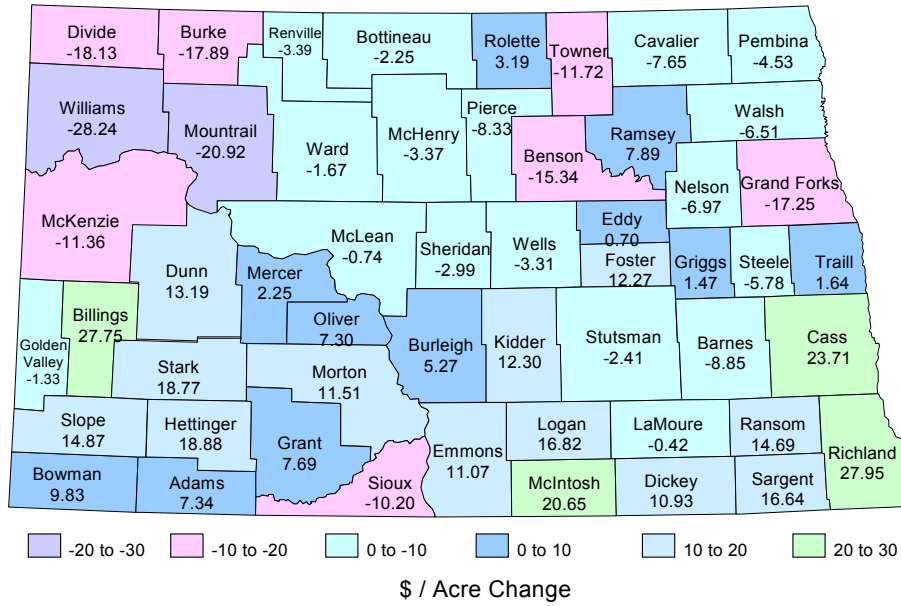


Figure 3. Average Change in Non-Cropland Values by County

Percentage Change in Non-Cropland Values Using A Capitalized Cash Rent Approach

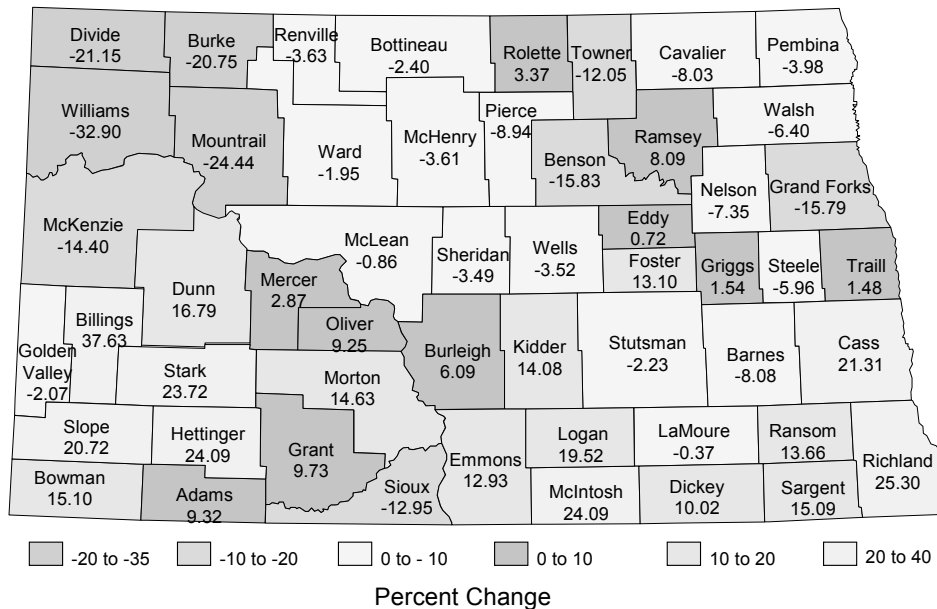


Figure 4. Percentage Change in Non-Cropland Values by County

The model is run using 2000, 2001, and 2002 data for each county. Both cropland and non-cropland values were analyzed.

The analysis was run using *SAS* (SAS Institute Inc., 1998) software. A paired t-test was used with an alpha of 0.05. This would be at the 95 percent significance level.

The results showed that cropland values were significantly different. This was true for 2000, 2001, and 2002 data run as separate years. This also was true when cropland data for all years were combined and run. Table 10 summarizes the statistical results for cropland. Figure 5 shows the cropland value scatter diagram. Figure 7 shows the cropland differences scatter diagram. Figure 9 shows cropland and non-cropland differences by year.

Table 10. Statistical Results for Cropland Differences.

	2000	2001	2002	Combined
t Value	-11.18	-10.93	-10.85	-18.93
p Value	<.0001	<.0001	<.0001	<.0001

Non-cropland values were not significantly different for 2000 and 2001; they were, however, significantly different for 2002. When pasture data for all years were combined and run, no significant differences were found. Table 11 summarizes the statistical results for non-cropland. Figure 6 shows the non-cropland value scatter diagram. Figure 8 shows the non-cropland differences scatter diagram. Figure 9 shows cropland and non-cropland differences by year.

Table 11. Statistical Results for Non-Cropland Differences.

	2000	2001	2002	Combined
t Value	-0.39	1.15	2.56	1.94
p Value	0.6949	0.2562	0.0136	0.0543

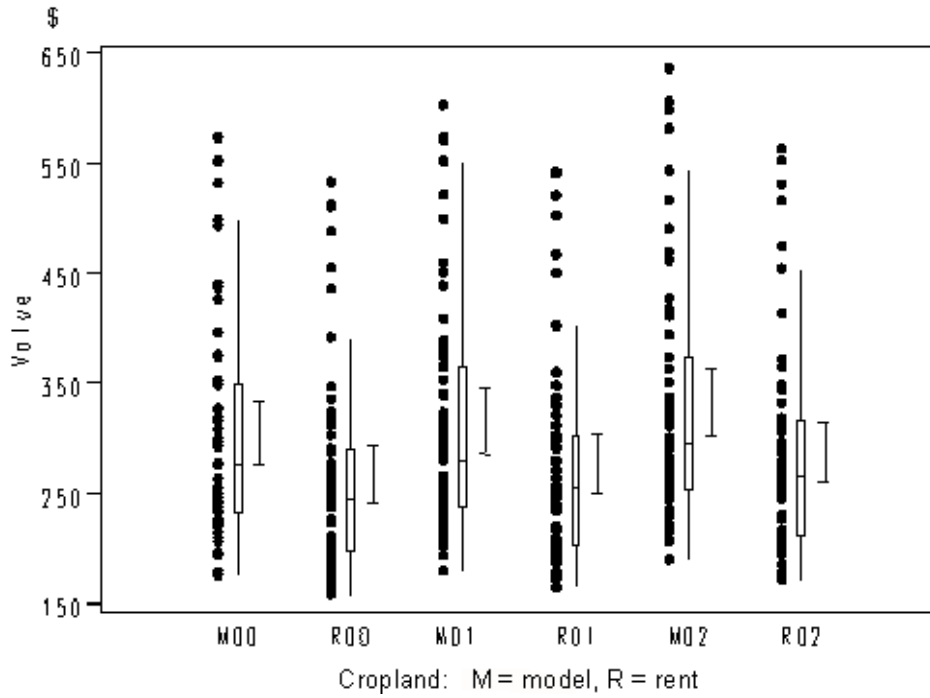


Figure 5. Cropland Value Scatter Diagram

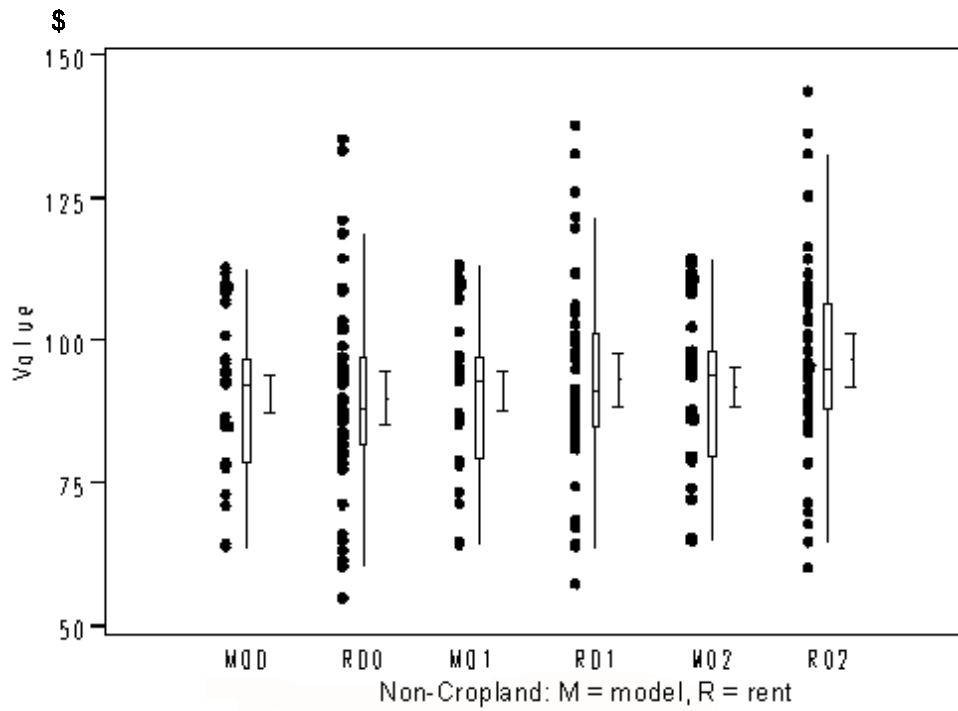


Figure 6. Non-Cropland Value Scatter Diagram

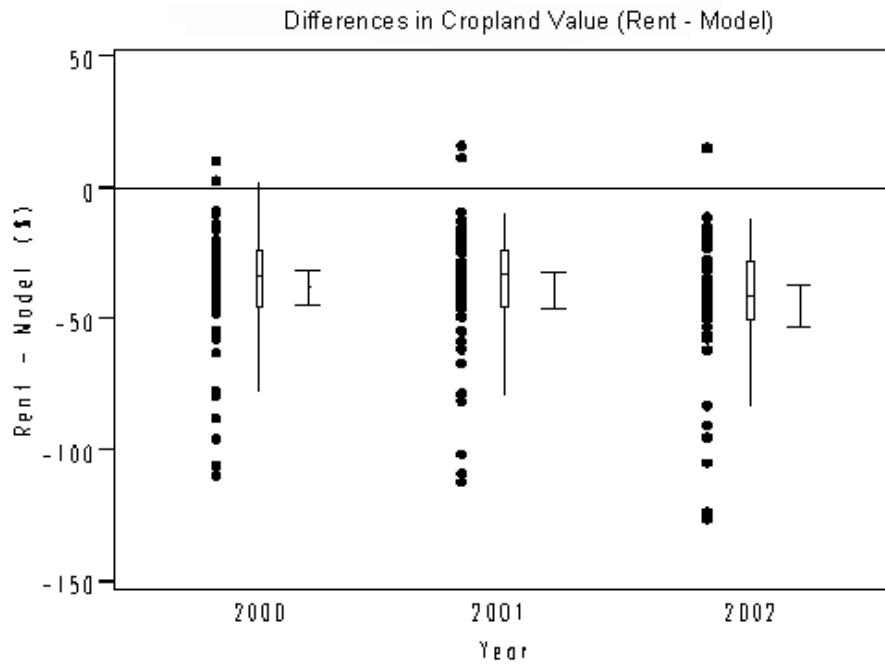


Figure 7. Cropland Differences Scatter Diagram

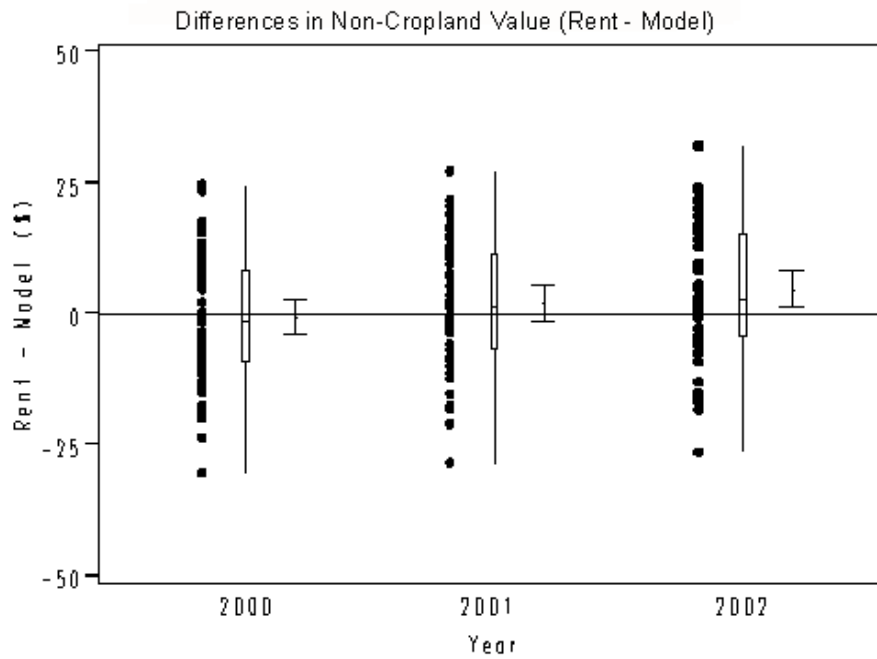


Figure 8. Non-Cropland Differences Scatter Diagram

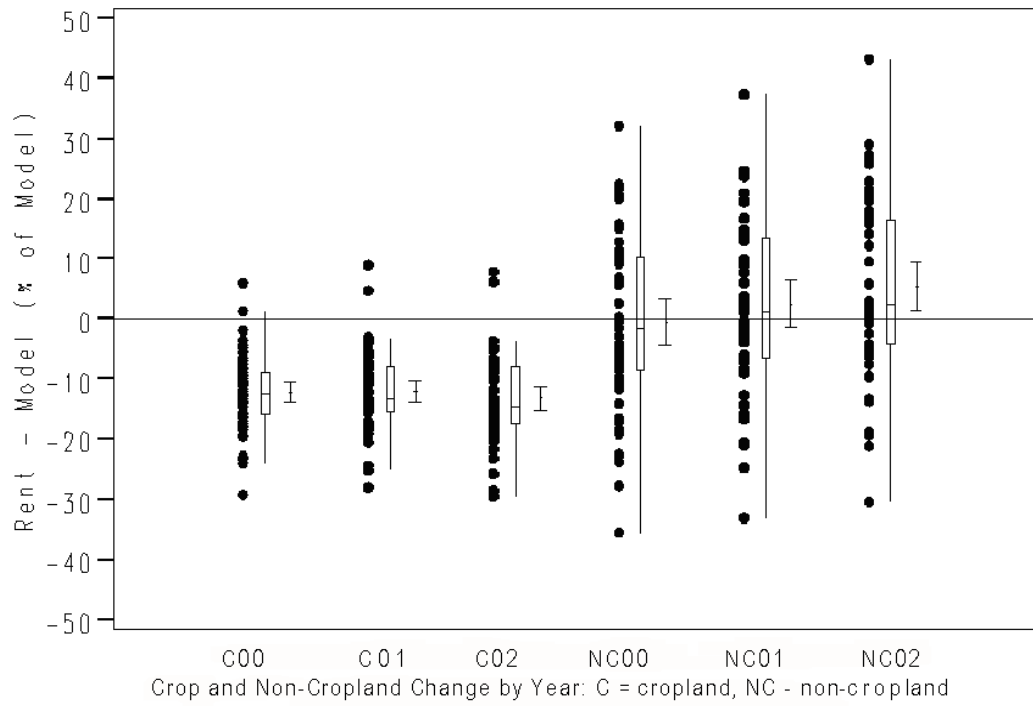


Figure 9. Cropland and Non-Cropland Differences by Year Scatter Diagram

Conclusions

The major conclusion is that the land valuation model provided a higher value of cropland for each of the three years analyzed and for the three-year combined analysis relative to the rent capitalization method. The result of the land valuation model for non-cropland is not significantly different from the rent capitalization value of pasture in 2000 and 2001 and the three-year combined analysis, but is significantly different for 2002. Assuming the rental survey is accurate and the capitalization rate is accurate (same rate is also used in the present land valuation model), land values for non-cropland using rent would be calculated the same as the current model.

When the current land valuation model was adopted by the North Dakota Legislature, it was assumed that a one-third share lease was commonplace and equitable. The one-third share was reduced to 30 percent for all crops but sugarbeets and potatoes to reflect the landowner's marketing cost and real estate tax. Sugarbeets and potatoes were set at 20 percent. Since that time, operating costs have increased considerably. The result is that land no longer represents one-third of the cost of production. Producers understand that and have gone to cash rents as opposed to share rents and bid rents to a level below what the value of one-third of the crop would be. The Legislature recognized this and added the cost of production index to the model in an attempt to compensate for this change. This procedure will, however, take time to bring the results of the current model in line with capitalizing cash rents.

The model assumes the landowner share of annual returns from non-cropland is 25 percent as opposed to 30 percent for cropland. Since productivity of the beef enterprise is held constant in the model, while weaning weights have in fact increased, and with the lower percentage for landowner share, it is to be expected the two methods would yield similar results. This explains why there was a significant difference in non-cropland values between the two methods only in the 2002 assessment. The other two years individually and the combined were not significantly different.

The first objective of this study was accomplished; the differences were calculated. The second objective was achieved; statistical methods determined significance.

The study may be limiting because it is dependent on the accuracy of the rental survey conducted by the North Dakota Agricultural Statistics Service. The NDASS uses accepted statistical procedures to get the most accurate survey possible. The number of observations in this survey is small; it could be stated that survey responses may be manipulated to state lower cash rents and, in turn, lower land valuations and, thus, lower taxes. County and townships would in theory raise mill levies to maintain adequate incomes.

This analysis was based on only three years' data. Data for future years, when available, should be used to update the findings. The model could also be refined to the county and township levels using soil surveys, global positioning systems, and satellite imaging.

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- U.S. Department of Agriculture. *North Dakota County Rents & Values*. North Dakota Agricultural Statistics Service, United States Department of Agriculture, Fargo, ND. Annual publications March 1989 to March 2000.

Appendix – The Survey Instrument



**North Dakota
Agricultural
Statistics Service**

U.S. Department of Agriculture - National Agricultural Statistics Service

P.O. Box 3166, Fargo, ND 58108-3166
Telephone: 701-239-5306 FAX: 701-239-5613
E-mail: nass-nd@nass.usda.gov

LAND RENT AND VALUE SURVEY - 2001

Project Code 449

Dear Operator:

We are conducting this survey in cooperation with the North Dakota State Land Department to measure average agricultural land cash rents and values in your locality. Your opinion of average agricultural land cash rents and values in your locality is very important in determining county averages. Your response is voluntary and not required by law. Individual reports are kept confidential and used only with other reports to determine averages.

Sincerely,

Larry W. Beard
State Statistician

Please make corrections in name, address and zip code, if necessary.

INSTRUCTIONS: Please provide **YOUR OPINION** of average **CASH RENTS** and **MARKET VALUES** per acre of **NON-IRRIGATED** land rented for cash in your locality. Exclude share rents and leasing by AUMs or AUs.

LAND TYPE		AVERAGE CASH RENT Dollars	AVERAGE MARKET VALUE Dollars
1. CROPLAND RENTED for CASH	per acre	008 \$.__	009 \$
2. PASTURE or GRAZING LAND RENTED for CASH	per acre	010 \$.__	011 \$
3. ALFALFA and ALFALFA-GRASS MIXTURES to be cut for hay (exclude CRP) ..	per acre	012 \$.__	013 \$
4. OTHER TAME HAYLAND (exclude grain hay and wild hay)	per acre	014 \$.__	015 \$
5. WILD or PRAIRIE GRASS to be cut for hay	per acre	016 \$.__	017 \$

Would you like to receive a free copy of the survey summary? (Yes = 1)

099

910	098
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