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**RESULTS OF THE NORTH DAKOTA LAND VALUATION MODEL  
FOR THE 2006 AGRICULTURAL REAL ESTATE ASSESSMENT****Dwight G. Aakre and Harvey G. Vreugdenhil<sup>1</sup>**

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**ABSTRACT**

This report summarizes the 2006 results of the North Dakota Land Valuation Model. The model is used annually to estimate average land values by county, based on the value of production from cropland and non-cropland. The county land values developed from this procedure form the basis for the 2006 valuation of agricultural land for real estate tax assessment. The average “all land value” from this analysis is multiplied by the total acres of agricultural land on the county abstract to determine each county’s total agricultural land value for taxation purposes. The State Board of Equalization compares this value with the total value assessed to agricultural property in each county. Each county is required by state statute to assess a total value of agricultural property within 5 percent of this value.

The average value per acre of all agricultural land in North Dakota increased by 6.68 percent based on the value of production. Cropland value increased by 6.4 percent and non-cropland value increased by 7.76 percent. The formula capitalization rate was below the minimum set by the State Legislature, therefore the minimum rate of 8.3 percent was used.

Changes in market value are included for comparison. Market value data are from the annual County Rents and Values survey conducted by North Dakota Agricultural Statistics Service.

**Key Words:** Land valuation, real estate assessment, agricultural land

**NORTH DAKOTA LAND VALUATION MODEL**

State statute mandates that the Department of Agribusiness and Applied Economics, at North Dakota State University annually compute an estimate of 1) the average value per acre of agricultural lands on a statewide and countywide basis, and 2) the average value per acre for cropland and non-cropland (N.D.C.C. 57-02-27.2). These estimates are provided to the State Tax Department.

The model determines agricultural land values as the landowner share of gross returns divided by the capitalization rate. *Landowner share of gross returns* is the portion of revenue generated from agricultural land that is assumed to be received by the landowner, and is expected to reflect current rental rates. The Legislature has specified that the landowner share of gross returns is 30

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percent of gross returns for all crops except sugar beets and potatoes (20 percent), non-cropland (25 percent), and irrigated land (50 percent of the dryland rate).

### **Capitalization Rate**

The 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 specified the gross Federal Land Bank (AgriBank, FCB) mortgage interest rate for North Dakota be used as the basis for computing the capitalization rate. The capitalization rate used in the North Dakota Land Valuation model is a twelve year rolling average with the high and low rates dropped. The 2003 Legislature amended the capitalization rate formula by introducing a minimum level of 9.5 percent with no upper limit. The 2005 Legislature amended the capitalization rate formula again, specifying a rate no lower than 8.9 percent to be used for the 2005 analysis. For subsequent years the capitalization rate may not be lower than 8.3 percent. The capitalization rate calculated according to the formula was 7.426 percent. As a result, the minimum value of 8.3 percent was used for the 2006 assessment. The change in the capitalization rate was the most significant factor affecting any change in land values, relative to the previous year.

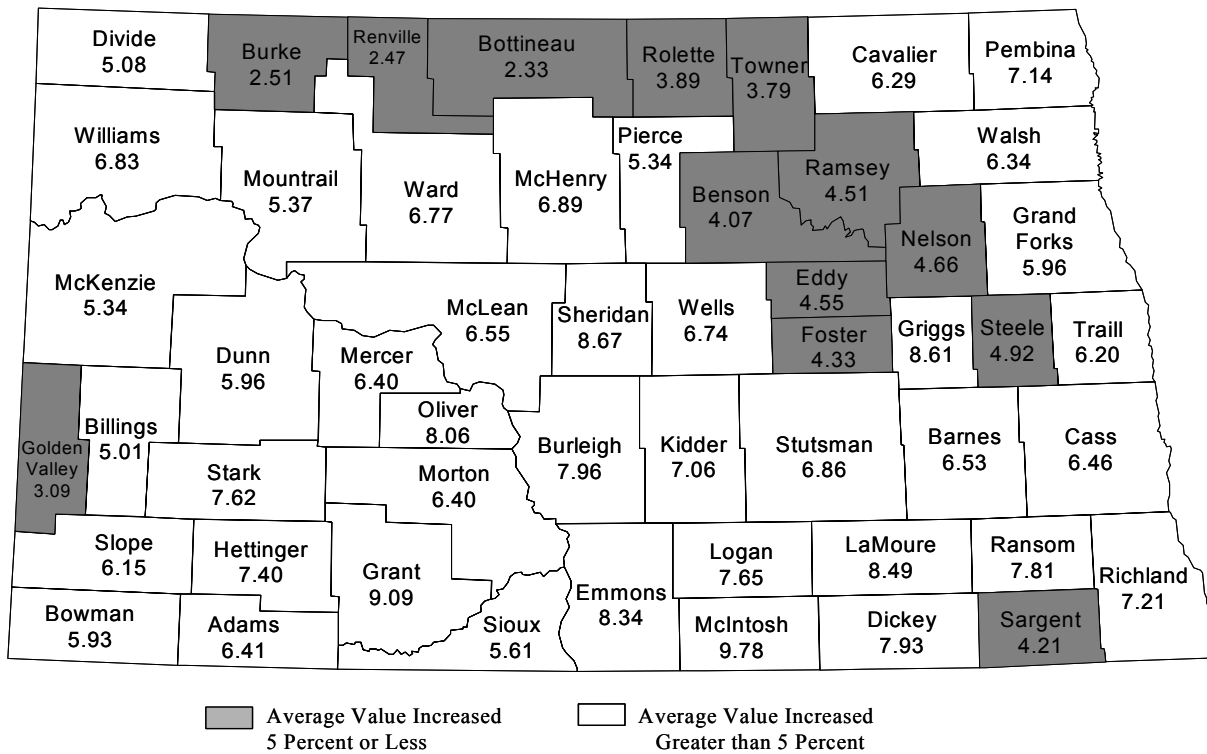
### **Cost of Production Index**

Beginning with the analysis for the 1999 assessment, a cost of production index was added to the land valuation model to account for the increasing proportion of the total cost of production represented by variable costs. The source of data for this index is the *Items Used For Production* from the *Prices Paid Index* published by National Agricultural Statistics Service. The index developed for this analysis was determined by averaging the values of the latest ten years after dropping the high and low values; and dividing this value by the base index. The base index was developed by averaging the index values from the years 1989 through 1995 after dropping the high and low values. The base index value is 102. The resulting index value used in the 2006 analysis was 116.054, which results in a reduction in the landowner share of gross returns of 13.83 percent. The landowner share of gross returns is the amount that is capitalized to determine the land values. Therefore, land values are 13.83 percent lower than they otherwise would have been if the cost of production index was not included in the model. The index used for 2006 increased from 113.848 in 2005, for a one-year change of 2.206 points.

### **RESULTS: ALL AGRICULTURAL LAND VALUE**

Valuation of all agricultural land in North Dakota, for the 2006 assessment, increased by 6.68 percent or \$17.87 per acre over the previous year. The largest percentage increase occurred in McIntosh County at 9.78 percent, followed by Grant County at 9.09 percent, Sheridan County at 8.67 percent, Griggs County at 8.61 percent, LaMoure County at 8.49 percent, Emmons County at 8.34 percent and Oliver County at 8.06 percent. Results are shown in Figure 1.

**Figure 1. Percent Change in Average Value of All Agricultural Land, 2005-2006**



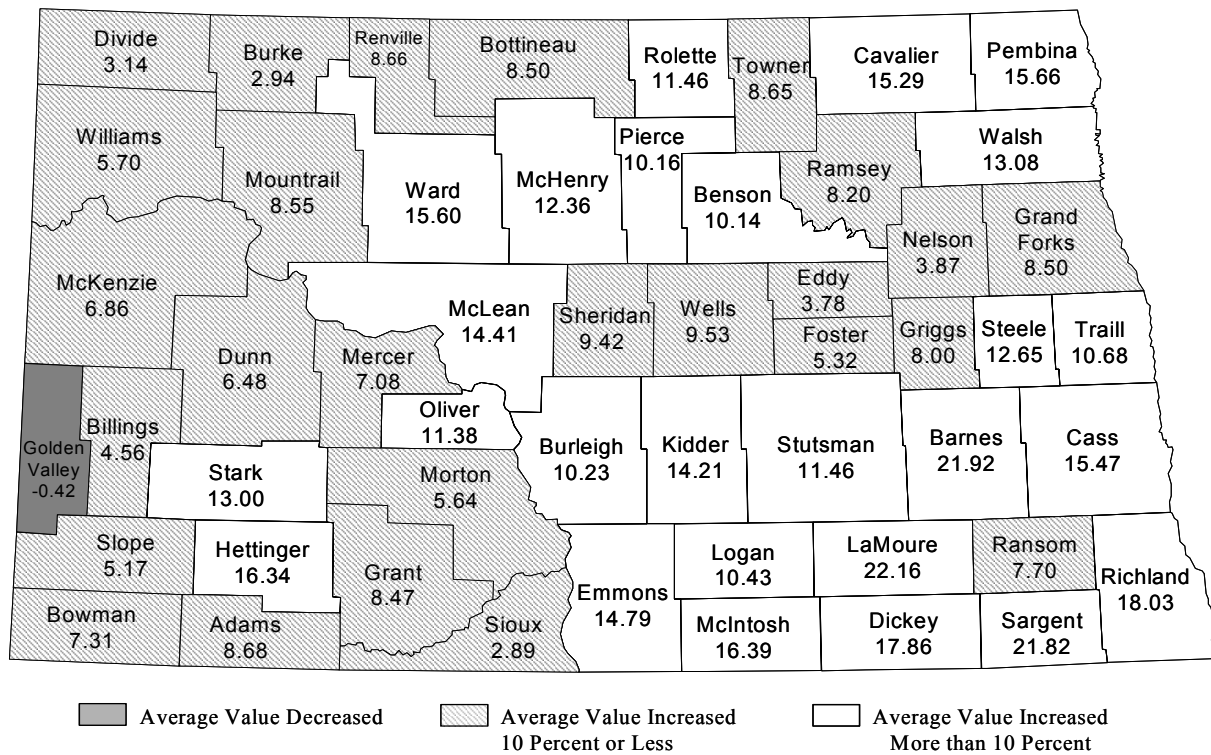
The smallest increases in average all agricultural land values included Bottineau County at 2.33 percent, Renville County at 2.47 percent, Burke County at 2.51 percent, Golden Valley County at 3.09 percent, Towner County at 3.71 percent and Rolette County at 3.89 percent.

The value for all agricultural land is a weighted average of cropland and non-cropland in each county. Calculated values for cropland generally are three to five times the value of non-cropland in each county. Therefore, a shift in acres between these two categories will alter the all land value even if all other factors remain unchanged. County Directors of Tax Equalization are surveyed each year to determine total taxable acres of cropland and non-cropland as well as inundated land for each category. Changes in reported acres tend to be minimal. Shifting acres from cropland to non-cropland results in a lower value for all agricultural land independent of what happens to gross revenue, the capitalization rate and the cost of production index.

## Five-Year Trend: All Agricultural Land Value

Estimated values for 2006 were compared with values estimated for 2001 to see how they have changed over time. The percent change in value by county is shown in Figure 2. The average value for all agricultural land in North Dakota increased 12.7 percent from 2001 to 2006. Three counties showed increases of at least 20 percent. They were LaMoure County at 22.16 percent, Barnes County at 21.92 percent and Sargent County at 21.82 percent. Twenty-three counties increased in value between 10 and 20 percent and 26 counties increased less than 10 percent. Only one county, Golden Valley, declined in value from five years earlier. The value in 2006 was 0.42 percent lower than in 2001.

**Figure 2. Percent Change in Average Value of All Agricultural Land, 2001-2006**



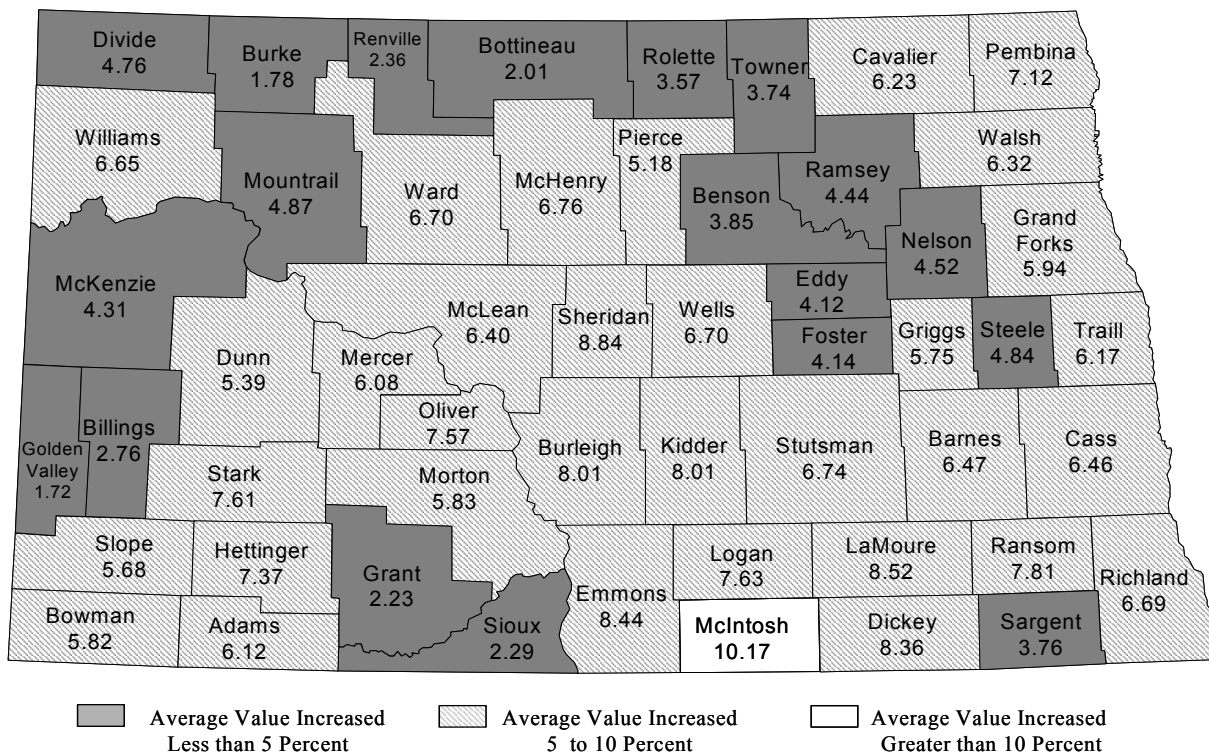
## RESULTS: CROPLAND VALUE

The average value of cropland in North Dakota increased by \$22.59 per acre or 6.4 percent. Cropland values increased in all counties. See Figure 3. The largest increase in average cropland value was 10.17 percent in McIntosh County. Sheridan, LaMoure, Emmons, Dickey, Burleigh and Kidder counties all increased in value in excess of 8.0 percent.

Counties with the lowest increase in cropland values were Golden Valley County (1.72 percent), Burke County (1.78 percent), Bottineau County (2.01 percent), Grant County (2.23 percent), Sioux County (2.29 percent), Renville County (2.36 percent) and Billings County (2.76 percent).

Changes in the capitalization rate and cost of production index impact all counties equally. The capitalization rate was down from 2005. The lower capitalization rate increased values by 7.23 percent. Twelve counties had increases in cropland values of 7.23 percent or more, thus the average value of production increased in these counties as well. The increase in the cost of production index resulted in a downward shift in land values of 1.93 percent from 2005.

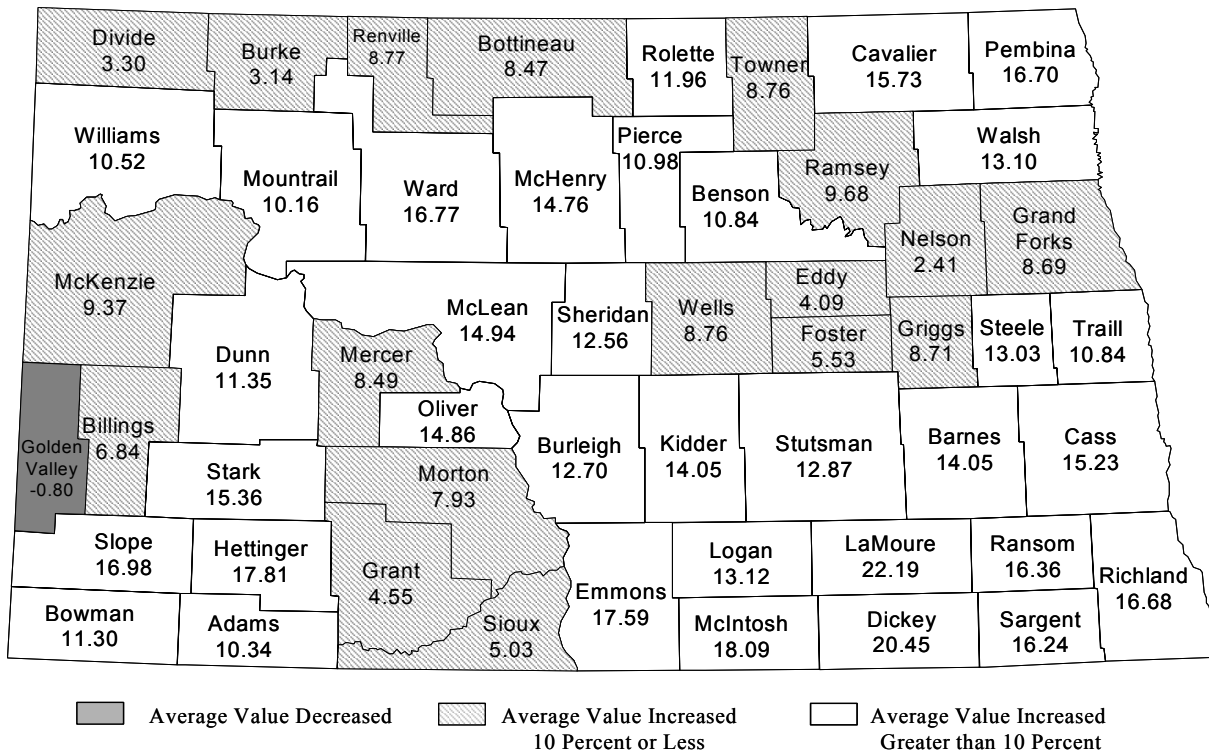
**Figure 3. Percent Change in Average Value of Cropland, 2005-2006**



## Five-year Trend: Cropland Value

Cropland values have increased in all counties except Golden Valley over the 2001-2006 period. The average value of North Dakota cropland was 13.79 percent higher in 2006 than in 2001. The rate of increase has been highly variable around the state as can be seen in Figure 4. Golden Valley declined by 0.8 percent, while 18 counties increased less than 10 percent. Values increased by more than 10 percent in 34 counties. The largest increases were LaMoure County at 22.19 percent and Dickey County at 20.45 percent.

**Figure 4. Percent Change in Average Value of Cropland, 2001-2006**



## **RESULTS: NON-CROPLAND VALUE**

The value of non-cropland (grazing land) increased by 7.76 percent for the 2006 assessment. The value of non-cropland is derived by calculating the value of the beef produced from grazing. The carrying capacity and the production per cow are held constant in the model. As a result, all change in non-cropland value is due to changes in the price of calves and cull cows and changes in the capitalization rate and the cost of production index. All of these factors apply equally across all counties, therefore all counties experienced the same percentage increase in non-cropland values over 2005.

The price of calves and cull cows are used to determine the value of an animal unit month (AUM) of grazing. AUM is used as the measure of productivity of grazing land. Based on the price of calves and cull cows, an AUM had a value of \$78.01 for the 2004 marketing year, the most recent year added to the data set. This was up from \$66.51 the previous year. The value calculated for non-cropland, like cropland, is based on the average of the latest ten years after dropping the high and low years. Therefore, the average gross return is heavily influenced by the comparative values for the latest year added to the data set, relative to the year just removed from the data set. The average value per AUM for 1994, the year rolled out of the data set for this analysis, was \$59.62. As a result, the increase in value for non-cropland is a combination of an increase in the value of production, an increase due to a lower capitalization rate, and a decrease due to the increase in the cost of production index.

### **Five-year Trend: Non-Cropland Value**

Non-cropland values increased by 1.6 percent across the state from 2001 to 2006. All counties experienced the same change.

Two tables are provided comparing county values for 2005 and 2006. North Dakota Capitalized Average Annual Values Per Acre by County for 2005 are shown in Table 1. North Dakota Capitalized Average Annual Values Per Acre by County for 2006 are shown in Table 2.



Table 1. North Dakota Capitalized Average Annual Values Per Acre by County for 2005 Assessment

County	Cropland	Non-cropland	All Agricultural Land
Adams	211.81	74.21	159.72
Barnes	438.62	103.09	378.68
Benson	317.38	91.27	268.64
Billings	188.26	69.46	106.42
Bottineau	321.46	88.33	282.13
Bowman	214.11	61.30	136.63
Burke	253.76	81.22	201.59
Burleigh	248.41	81.47	173.04
Cass	566.32	104.82	553.47
Cavalier	409.02	89.58	363.73
Dickey	433.21	102.84	328.23
Divide	239.69	80.76	197.74
Dunn	218.16	74.02	128.31
Eddy	291.07	91.66	231.42
Emmons	289.97	80.69	200.83
Foster	359.16	88.23	309.63
Golden Valley	222.99	60.81	139.27
Grand Forks	513.15	102.89	478.04
Grant	216.04	74.40	136.82
Griggs	376.68	89.91	308.65
Hettinger	279.16	73.83	228.11
Kidder	253.16	82.28	176.50
LaMoure	429.55	106.35	387.01
Logan	269.33	81.19	178.64
McHenry	265.65	87.74	211.43
McIntosh	263.35	80.73	192.09
McKenzie	260.75	74.32	149.15
McLean	312.43	80.95	272.54
Mercer	238.15	73.98	167.06
Morton	244.11	74.16	144.76
Mountrail	273.01	80.65	192.71
Nelson	333.30	89.42	291.76
Oliver	285.00	74.37	160.79
Pembina	657.43	107.12	586.60
Pierce	282.68	87.76	241.22
Ramsey	335.95	91.94	291.09
Ransom	474.92	101.29	362.82
Renville	332.03	88.02	313.23
Richland	628.26	104.07	552.35
Rolette	305.02	89.27	268.12
Sargent	516.70	103.87	450.40
Sheridan	266.25	80.72	194.01
Sioux	200.16	74.22	98.76
Slope	246.85	67.63	154.73
Stark	245.33	74.54	181.91
Steele	487.69	91.35	433.00
Stutsman	342.25	101.59	266.22
Towner	323.62	91.69	313.28
Traill	597.91	103.87	559.96
Walsh	588.74	95.86	536.52
Ward	333.41	80.64	274.31
Wells	348.21	88.56	301.98
Williams	227.11	80.87	170.52
State	352.95	79.49	267.66

Table 2. North Dakota Capitalized Average Annual Values Per Acre by County for 2006 Assessment

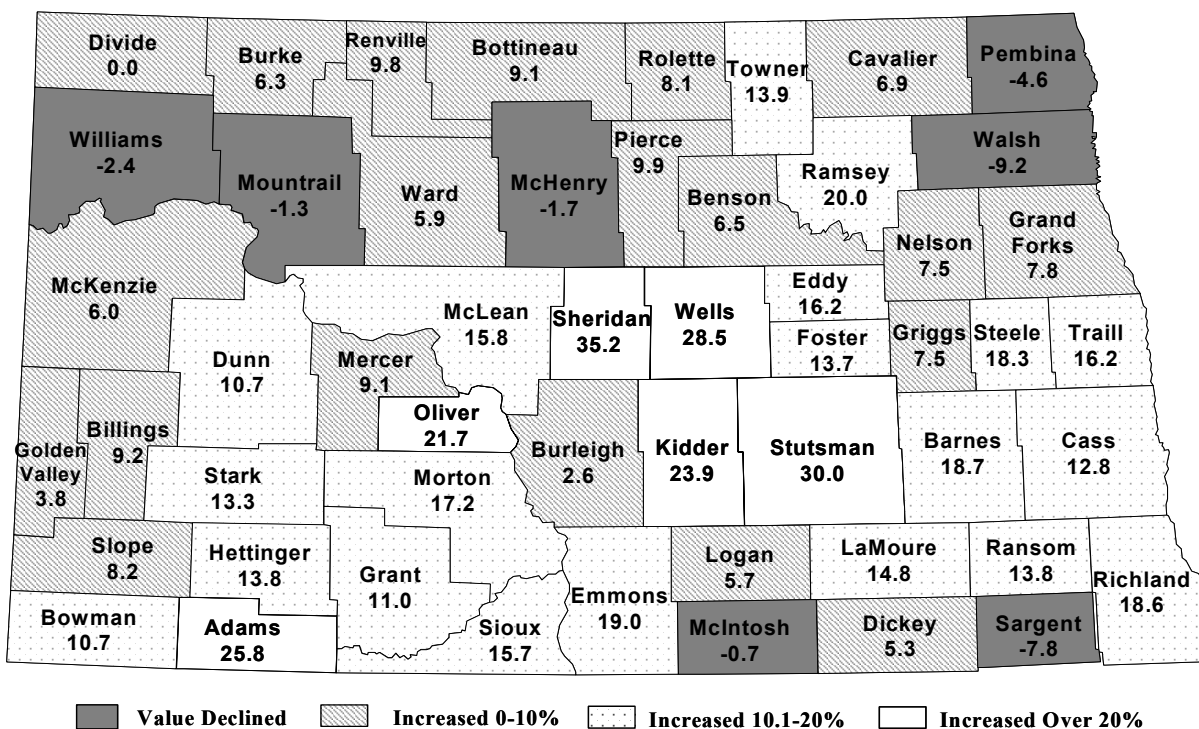
County	Cropland	Non-cropland	All Agricultural Land
Adams	224.77	79.97	169.96
Barnes	466.98	111.10	403.39
Benson	329.60	98.36	279.58
Billings	193.46	74.86	111.75
Bottineau	327.93	95.19	288.71
Bowman	226.58	66.06	144.73
Burke	258.27	87.53	206.65
Burleigh	268.32	87.80	186.82
Cass	602.89	112.96	589.25
Cavalier	434.52	96.53	386.60
Dickey	469.42	110.83	354.25
Divide	251.09	87.03	207.78
Dunn	229.92	79.76	135.96
Eddy	303.07	98.78	241.96
Emmons	314.45	86.95	217.57
Foster	374.04	95.08	323.04
Golden Valley	226.82	65.53	143.57
Grand Forks	543.65	110.88	506.55
Grant	220.85	80.18	149.26
Griggs	398.34	96.89	335.21
Hettinger	299.73	79.57	245.00
Kidder	273.43	88.67	188.96
LaMoure	466.14	114.61	419.87
Logan	289.89	87.50	192.30
McHenry	283.62	94.56	225.99
McIntosh	290.14	87.00	210.88
McKenzie	271.99	80.09	157.12
McLean	332.42	87.24	290.39
Mercer	252.64	79.73	177.76
Morton	258.35	79.91	154.02
Mountrail	286.30	86.91	203.06
Nelson	348.35	96.36	305.35
Oliver	306.58	80.15	173.75
Pembina	704.25	115.44	628.46
Pierce	297.31	94.58	254.10
Ramsey	350.86	99.09	304.23
Ransom	511.99	109.16	391.17
Renville	339.85	94.85	320.97
Richland	670.30	112.16	592.17
Rolette	315.92	96.21	278.56
Sargent	536.11	111.94	469.38
Sheridan	289.79	86.99	210.84
Sioux	204.75	79.98	104.30
Slope	260.86	72.88	164.24
Stark	263.99	80.33	195.77
Steele	511.29	98.44	454.32
Stutsman	365.31	109.49	284.49
Towner	335.72	98.81	325.16
Traill	634.83	111.94	594.67
Walsh	625.92	103.30	570.55
Ward	355.74	86.90	292.87
Wells	371.54	95.44	322.34
Williams	242.22	87.15	182.16
State	375.54	85.66	285.53

## MARKET VALUE OF NORTH DAKOTA FARM LAND

The North Dakota Land Valuation Model was designed to estimate the value of agricultural land dependent solely on the revenue generated from the production of crops and beef cattle. The results of this model were not intended to reflect market value. Market value of farm land is influenced by numerous factors in addition to its productivity value. These include farm enlargement to gain economies of scale, land as an investment, recreational uses, development potential and the effect of government fiscal, monetary and tax policies. As a result, market value and productivity value often differ by a significant amount.

The North Dakota Agricultural Statistics Service conducts an annual survey of farmers and ranchers to obtain rental rates and the value of rented land. The data from the 2006 survey were compared with the 2005 survey for cropland and pasture. Changes in market values by county for cropland varied widely across the state. This survey showed values declined in 2006 in seven counties with the largest decline in Walsh County at a negative 9.2 percent. Other counties reporting a decline in market values from 2005 to 2006 include: McHenry, McIntosh, Mountrail, Pembina, Sargent and Williams. Values increased less than 10.0 percent in 19 counties, from 10.0 to 20.0 percent in 20 counties and over 20.0 percent in 6 counties. Divide County reported no change in market value. The largest increase in market value of cropland occurred in Sheridan County at 35.2 percent. Percentage changes in market value for cropland by county are shown in Figure 5.

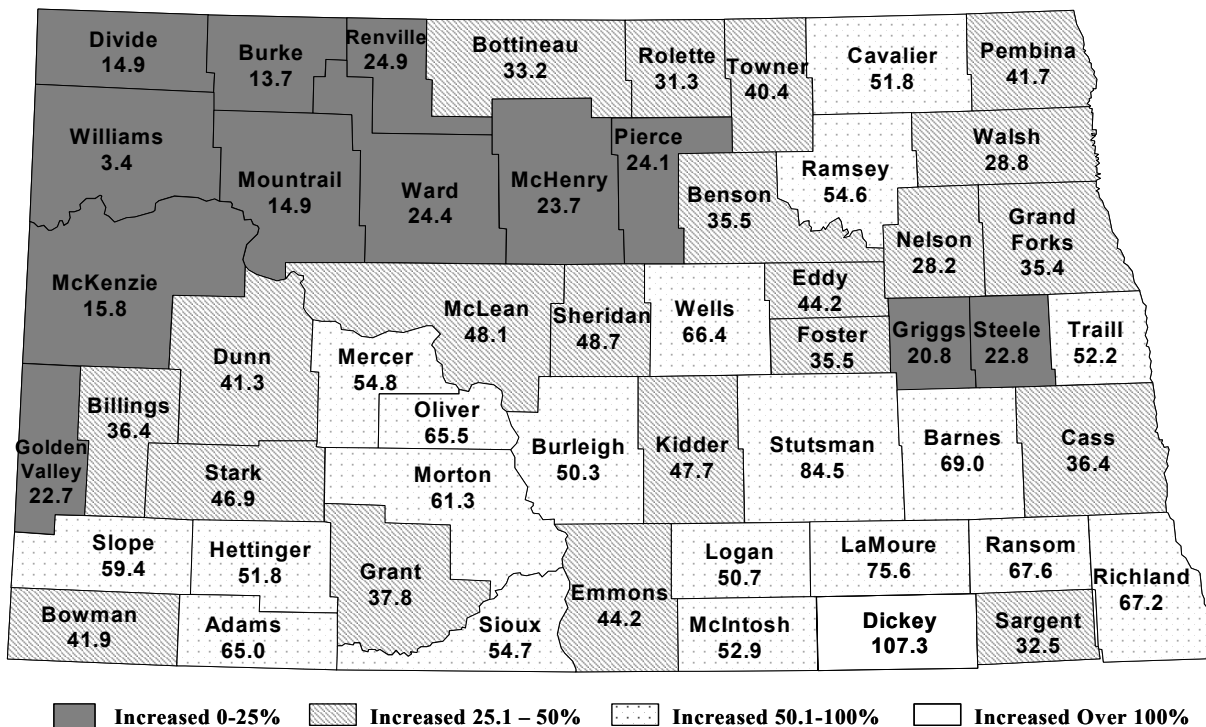
**Figure 5. Percent Change in Estimated Market Value of Cropland, 2005-2006**



## Five-year Trend: Market Value of Cropland

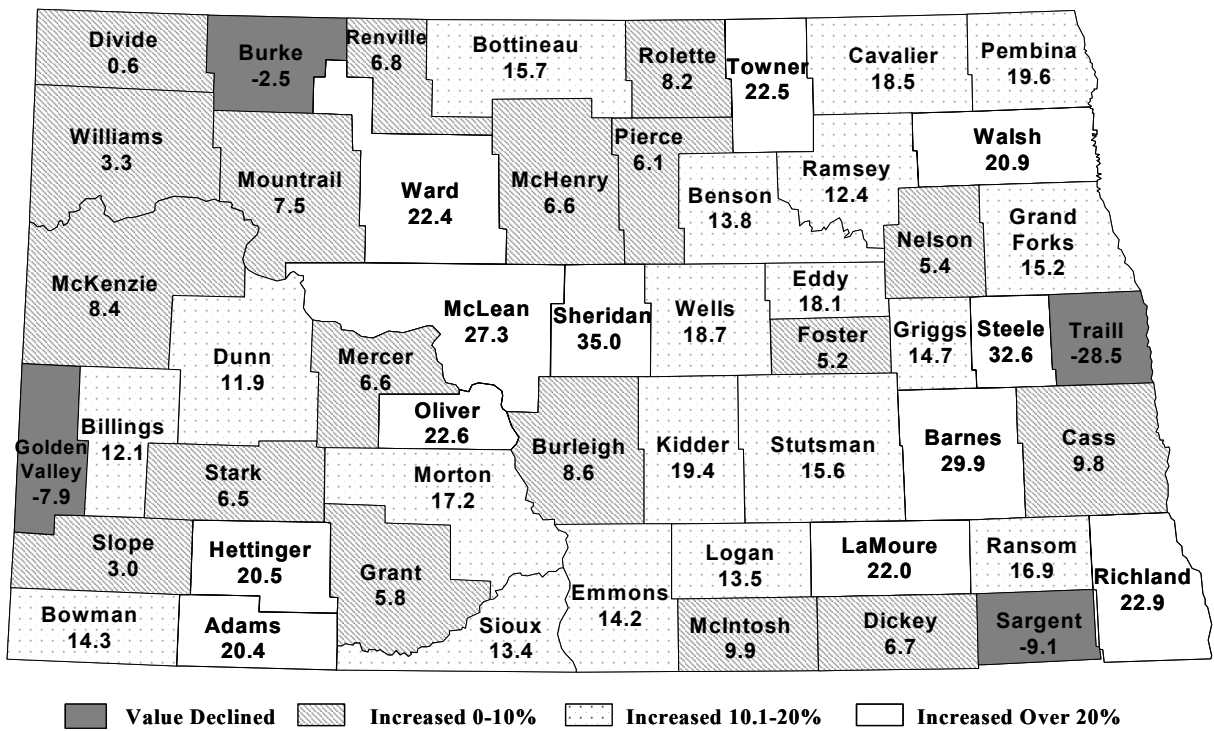
The estimated market value of cropland reported by NASS has increased significantly more than the increase in productivity value over the 2001-2006 time period. The only exception, Williams county experienced a smaller percentage increase in market value than the increase in productivity value. Dickey County market value increased 107.3 percent. Other counties with large increases in market values were Stutsman at 84.5 percent, LaMoure at 75.6 percent and Barnes, Richland, Ransom, Wells, Oliver, Morton and Adams all greater than 60 percent. Percentage changes in cropland market values are shown in Figure 6.

**Figure 6. Percentage Change in Estimated Market Value of Cropland, 2001-2006**



The change in market value of pasture was highly variable across the state as well. The survey indicated market values declined in 4 counties with the largest decline being a negative 28.5 percent in Traill County. Eighteen counties had increases in value of less than 10 percent, 19 counties showed increases between 10.0 and 20.0 percent and 12 counties increased greater than 20 percent. Percentage changes in the market value of pasture are shown in Figure 7.

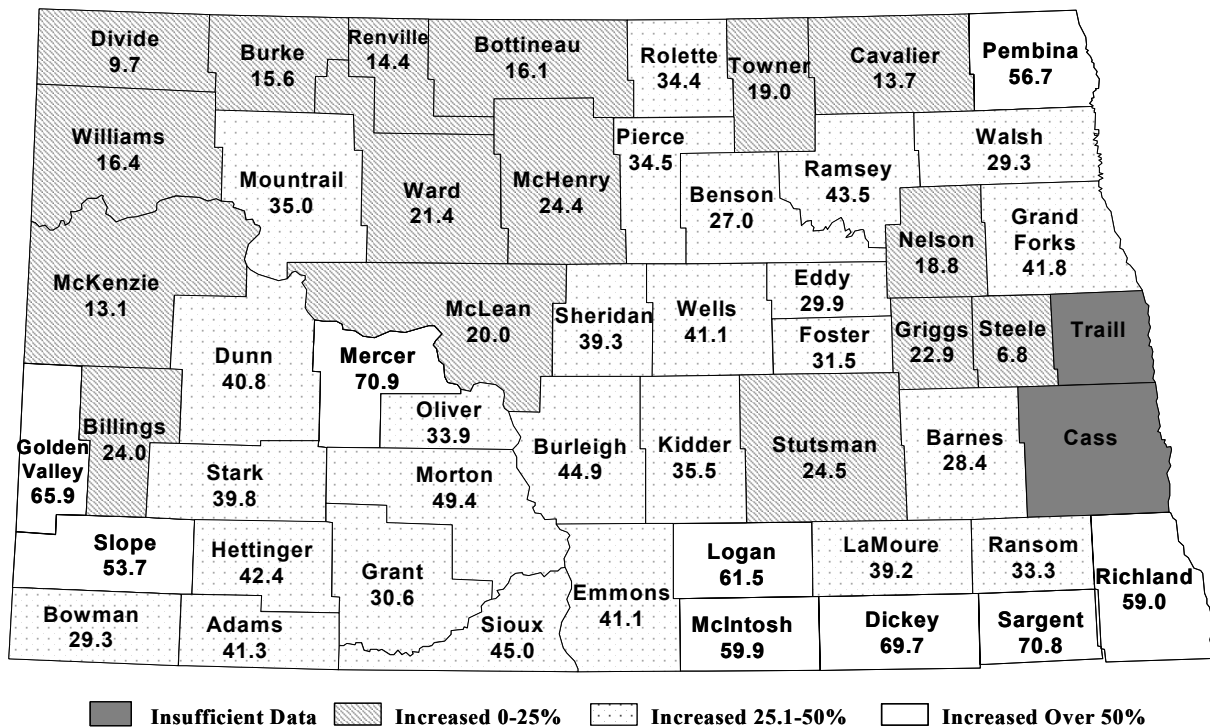
**Figure 7. Percent Change in Estimated Market Value of Pasture, 2005-2006**



## Five-year Trend: Market Value of Pasture

Since 2001, market value estimates of pasture have shown considerable strength across most of the state. See Figure 8. Cass and Traill counties had insufficient data for 2001 so no comparison could be made. The amount of increase was variable throughout the state. Market value increases were generally greater in the southern half of the state.

**Figure 8. Percentage Change in Estimated Market Value of Pasture, 2001-2006**



## CONCLUSIONS

Valuation of all agricultural land in North Dakota, based on productivity, increased by 6.68 percent or \$17.87 per acre for the 2006 assessment as compared to the previous year. The average value of all agricultural land increased in all counties. Seven counties showed increases greater than 8 percent.

The average value of cropland in North Dakota increased by \$22.59 or 6.4 percent. The largest increase was 10.17 percent in McIntosh County. Non-cropland values for all counties increased by 7.76 percent from the previous year. Productivity of non-cropland does not change from year to year. The price of cull cows and calves, cost of production index and the capitalization rate are

applied uniformly across all counties. Therefore, the percentage change in non-cropland value is the same for all counties.

The capitalization rate used for the 2006 analysis was the minimum value of 8.3 percent. The 2005 Legislature changed the minimum rate to 8.3 percent for the 2006 and subsequent years. The calculated rate based on the formula was 7.426 percent..

The cost of production index increased by 2.206 points over the previous year to 116.054. The cost of production index reduced the landowner share of gross returns by 13.83 percent before this value is capitalized.

Changes in market value of cropland and pasture based on the survey of farmers and ranchers by North Dakota Agricultural Statistics Service is included for comparison. Changes in market values show much more variability than agricultural value based on the land valuation model. This is expected due to the additional factors that influence market values.

## **REFERENCES**

North Dakota Agricultural Statistics Service, USDA, "North Dakota 2004 County Rents & Values," April 2005.

North Dakota Agricultural Statistics Service, USDA, "North Dakota 2005 County Rents & Values," April 2006.

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## CONTACT INFORMATION

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