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**RESULTS OF THE NORTH DAKOTA  
LAND VALUATION MODEL  
FOR THE 2007 AGRICULTURAL REAL ESTATE ASSESSMENT**

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## ABSTRACT

This report summarizes the 2007 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 2007 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 0.79 percent, from 2006 to 2007, based on the value of production. Cropland value increased by 0.36 percent and non-cropland value increased by 5.17 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

# RESULTS OF THE NORTH DAKOTA LAND VALUATION MODEL FOR THE 2007 AGRICULTURAL REAL ESTATE ASSESSMENT

Dwight G. Aakre and Harvey G. Vreugdenhil<sup>1</sup>

## 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 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 that 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 7.325 percent. As a result, the minimum value of 8.3 percent was used for the 2007 assessment. Consequently, the capitalization rate was not a factor in the change in land values relative to the previous year.

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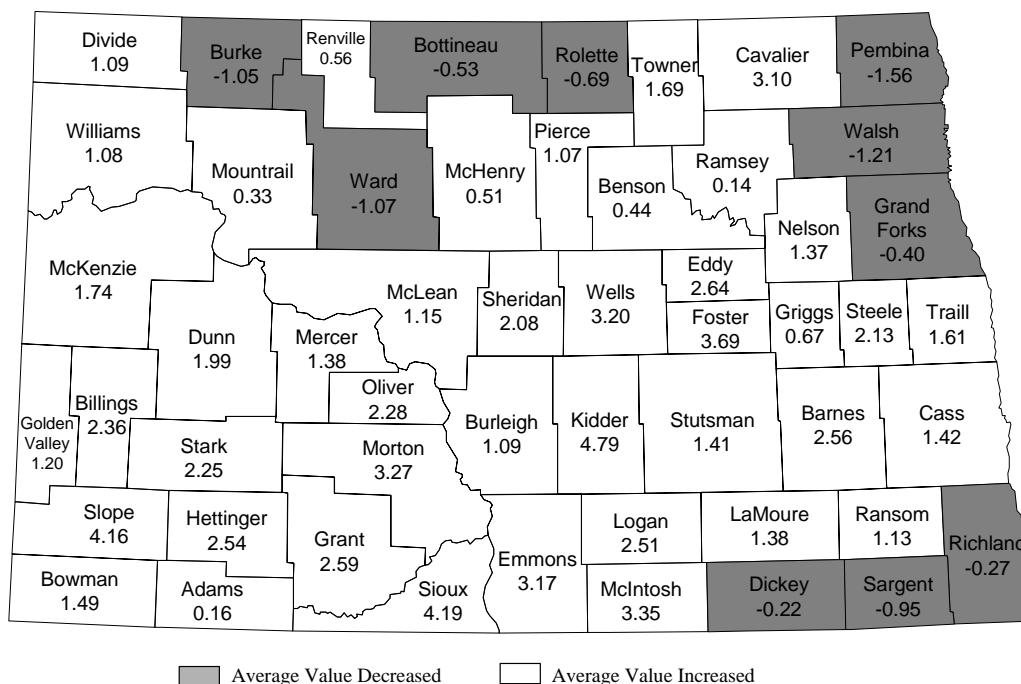
## Cost of Production Index

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 2007 analysis was 118.3824, which resulted in a reduction in the landowner share of gross returns of 15.53 percent. The landowner share of gross returns is the amount that is capitalized to determine the land values. Therefore, land values are 15.53 percent lower than they otherwise would have been if the cost of production index was not included in the model. The index used for 2007 increased from 116.054 in 2006, for a one-year change of 2.328 points.

### RESULTS: ALL AGRICULTURAL LAND VALUE

Valuation of all agricultural land in North Dakota, for the 2007 assessment, increased by 0.79 percent or \$2.25 per acre over the previous year. The largest percentage increase occurred in Kidder County at 4.79 percent, followed by Sioux County at 4.19 percent, Slope County at 4.16 percent, Foster County at 3.69 percent, McIntosh County at 3.35 percent, Morton County at 3.27 percent, Wells County at 3.20 percent, Emmons County at 3.17 percent and Cavalier County at 3.10 percent. Results are shown in Figure 1.

**Figure 1. Percent Change in Average Value of All Agricultural Land, 2006-2007**



The average value of all agricultural land declined in ten counties. They included Pembina County by 1.56 percent, Walsh County by 1.21 percent, Ward County by 1.07 percent, Burke County by 1.05 percent, Sargent County by 0.95 percent, Rolette County by 0.69 percent, Bottineau County by 0.53 percent, Grand Forks County by 0.40 percent, Richland County by 0.27 percent and Dickey County by 0.22 percent.

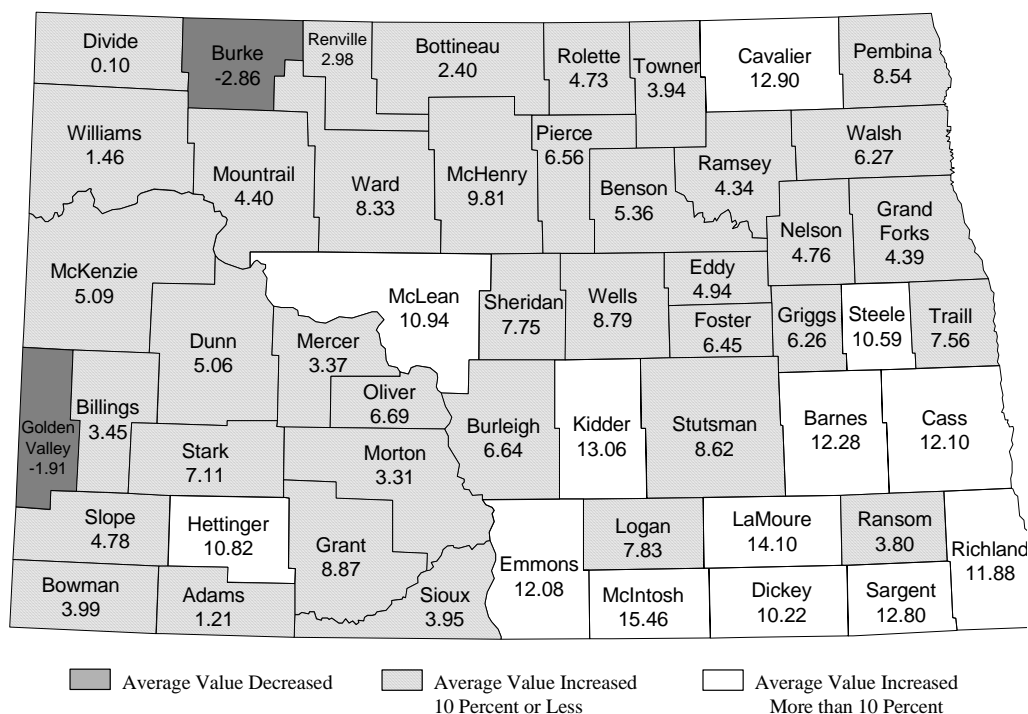
For all other counties, the average value of all agricultural land increased less than 3.0 percent.

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 2007 were compared with values estimated for 2002 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 8.99 percent from 2002 to 2007. Only one county, McIntosh County, increased more than 15 percent. Twelve counties showed increases between 10 and 15 percent. The average value in Burke County (-2.86%) and Golden Valley County (-1.91%), were less in 2007 than in 2002. The average value for 38 counties increased less than 10 percent over 2002.

**Figure 2. Percent Change in Average Value of All Agricultural Land, 2002-2007**





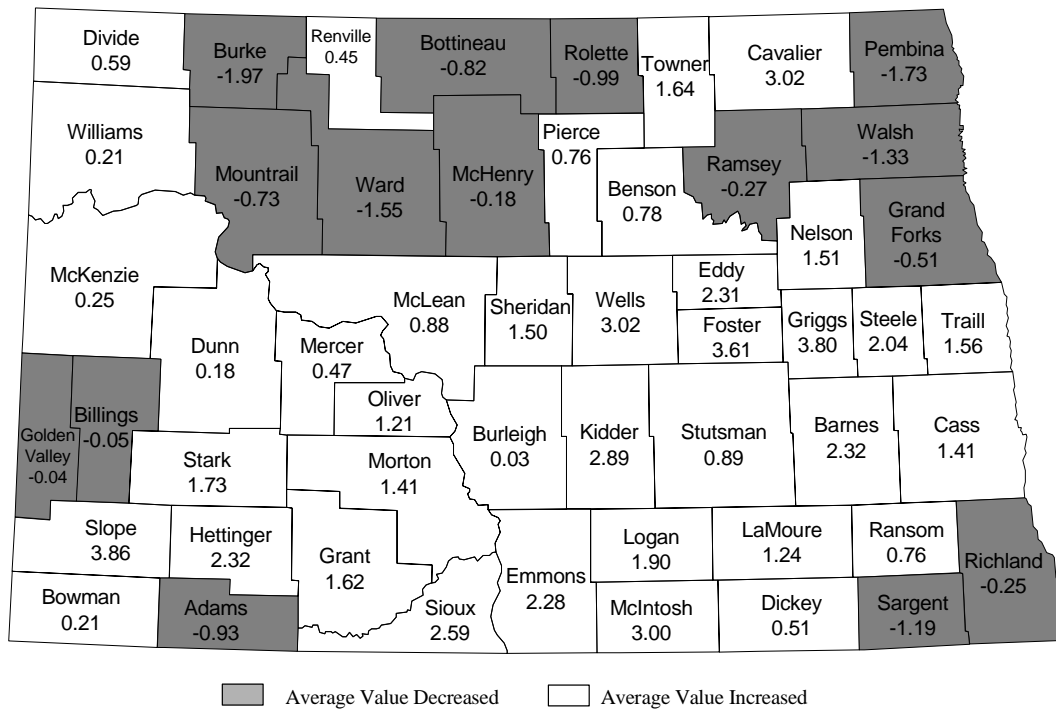
## RESULTS: CROPLAND VALUE

The average value of cropland in North Dakota increased by only \$1.37 per acre or 0.36 percent. Cropland values decreased in 15 counties. All decreases were less than 2 percent. See Figure 3.

The largest increase in average cropland value was 3.86 percent in Slope County. Other counties with average cropland value increases greater than 3 percent included Griggs, Foster, Cavalier, Wells and McIntosh.

Changes in the capitalization rate and cost of production index impact all counties equally. The capitalization rate used for the 2007 analysis was the minimum value, the same as used in the 2006 analysis. Therefore the capitalization rate was not a factor in changing cropland values from 2006 to 2007. The increase in the cost of production index resulted in a downward shift in land values of 1.97 percent from 2006.

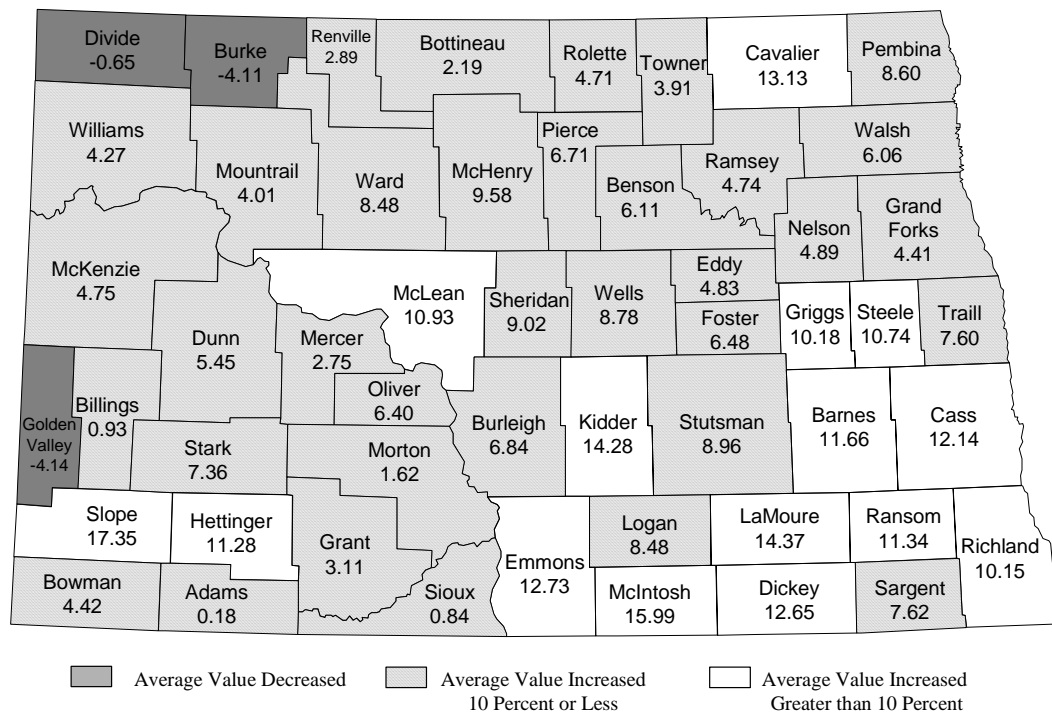
**Figure 3. Percent Change in Average Value of Cropland, 2006-2007**



## Five-year Trend: Cropland Value

Cropland values have increased in all but 3 counties over the 2002-2007 period. The average value of North Dakota cropland was 9.47 percent higher in 2007 than in 2002. The rate of increase has been highly variable around the state as can be seen in Figure 4. Golden Valley declined by 4.14 percent, Burke declined by 4.11 percent and Divide declined by 0.65 percent. All other counties showed an increase in average cropland value in 2007 relative to 2002. Values increased by less than 10 percent in 35 counties. Fifteen counties had increased cropland values greater than 10 percent. The largest increases were Slope County at 17.35 percent and McIntosh County at 15.99 percent.

**Figure 4. Percent Change in Average Value of Cropland, 2002-2007**



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

The value of non-cropland (grazing land) increased by 5.17 percent for the 2007 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 2006.

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 \$84.79 for the 2005 marketing year, the most recent year added to the data set. This was up from \$78.01 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 1995, the year rolled out of the data set for this analysis, was \$45.73. As a result, the increase in value for non-cropland is a combination of an increase in the value of production and a decrease due to the increase in the cost of production index. Since the cost of production index reduced values by 1.97 percent, the average gross revenue per acre over the 1996 to 2005 period increased by 7.14 percent

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

Non-cropland values increased by 5.93 percent across the state from 2002 to 2007. All counties experienced the same change.

Two tables are provided comparing county values for 2006 and 2007. North Dakota Capitalized Average Annual Values Per Acre by County for 2006 are shown in Table 1. North Dakota Capitalized Average Annual Values Per Acre by County for 2007 are shown in Table 2.

**Table 1. 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	111.1	403.39
Benson	329.6	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	87.8	186.82
Cass	602.89	112.96	589.25
Cavalier	434.52	96.53	386.6
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
Kidder	273.43	88.67	188.96
LaMoure	466.14	114.61	419.87
Logan	289.89	87.5	192.3
McHenry	283.62	94.56	225.99
McIntosh	290.14	87	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	286.3	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	254.1
Ramsey	350.86	99.09	304.23
Ransom	511.99	109.16	391.17
Renville	339.85	94.85	320.97
Richland	670.3	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	104.3
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	103.3	570.55
Ward	355.74	86.9	292.87
Wells	371.54	95.44	322.34
Williams	242.22	87.15	182.16
State	375.54	85.66	285.53

**Table 2. North Dakota Capitalized Average Annual Values Per Acre by County for 2007 Assessment**

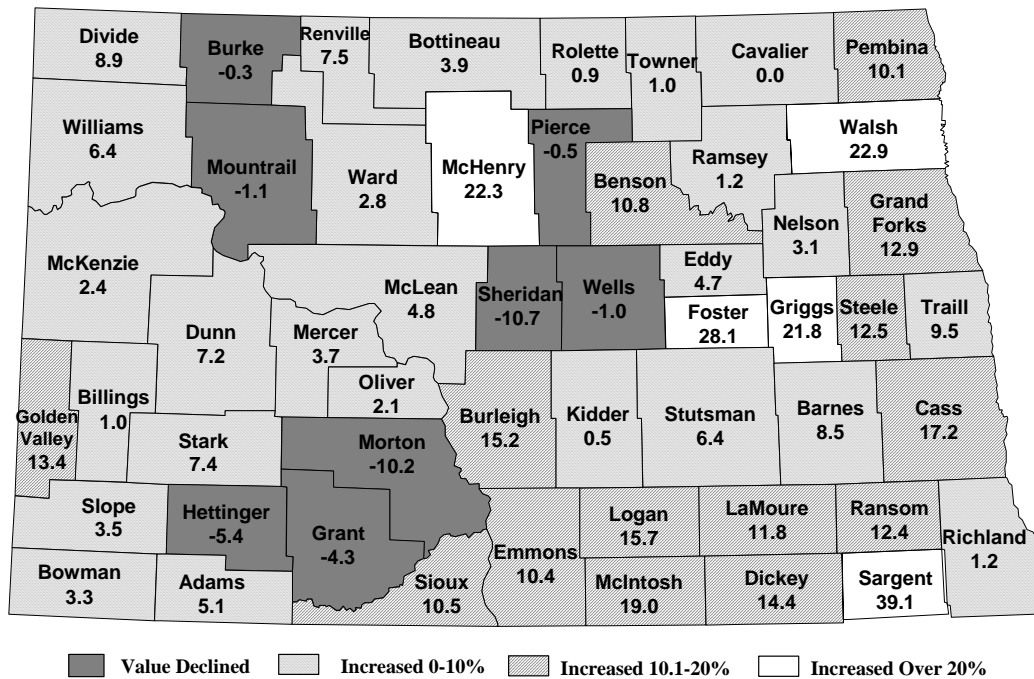
County	Cropland	Non-cropland	All Agricultural Land
Adams	222.69	84.11	170.23
Barnes	477.83	116.85	413.73
Benson	332.17	103.45	280.82
Billings	193.37	78.73	114.39
Bottineau	325.24	100.11	287.18
Bowman	227.05	69.48	146.89
Burke	253.19	92.06	204.47
Burleigh	268.41	92.34	188.85
Cass	611.37	118.8	597.59
Cavalier	447.64	101.53	398.58
Dickey	471.81	116.56	353.48
Divide	252.56	91.53	210.05
Dunn	230.33	83.89	138.67
Eddy	310.08	103.89	248.35
Emmons	321.61	91.45	224.47
Foster	387.53	100	334.96
Golden Valley	226.74	68.92	145.29
Grand Forks	540.87	116.62	504.5
Grant	224.43	84.32	153.13
Griggs	413.48	101.91	337.45
Hettinger	306.68	83.68	251.23
Kidder	281.32	93.26	198.02
LaMoure	471.9	120.54	425.65
Logan	295.39	92.02	197.13
McHenry	283.12	99.45	227.14
McIntosh	298.85	91.5	217.94
McKenzie	272.66	84.24	159.86
McLean	335.33	91.75	293.73
Mercer	253.83	83.85	180.22
Morton	262	84.05	159.05
Mountrail	284.22	91.41	203.73
Nelson	353.61	101.35	309.52
Oliver	310.28	84.3	177.72
Pembina	692.09	121.41	618.64
Pierce	299.56	99.47	256.81
Ramsey	349.92	104.21	304.67
Ransom	515.89	114.81	395.59
Renville	341.38	99.76	322.77
Richland	668.62	117.96	590.59
Rolette	312.8	101.18	276.63
Sargent	529.71	117.73	464.91
Sheridan	294.15	91.49	215.22
Sioux	210.06	84.12	108.67
Slope	270.93	76.65	171.07
Stark	268.55	84.49	200.18
Steele	521.71	103.54	464.01
Stutsman	368.56	115.15	288.51
Towner	341.22	103.92	330.65
Traill	644.74	117.73	604.26
Walsh	617.59	108.65	563.66
Ward	350.21	91.4	289.75
Wells	382.77	100.38	332.65
Williams	242.72	91.66	184.12
State	376.91	90.09	287.78

## 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 2007 survey were compared with the 2006 survey for cropland and pasture. Changes in market values by county for cropland varied widely across the state. This survey showed values declined in 2007 in eight counties with the largest decline in Sheridan County at a negative 10.7 percent. Other counties reporting a decline in market values from 2006 to 2007 include: Burke, Grant, Hettinger, Morton, Mountrail, Pierce, and Wells. Values increased less than 10.0 percent in 25 counties, from 10.0 to 20.0 percent in 14 counties and over 20.0 percent in 5 counties. Cavalier County reported no change in market value. The largest increase in market value of cropland occurred in Sargent County at 39.1 percent. Percentage changes in market value for cropland by county are shown in Figure 5.

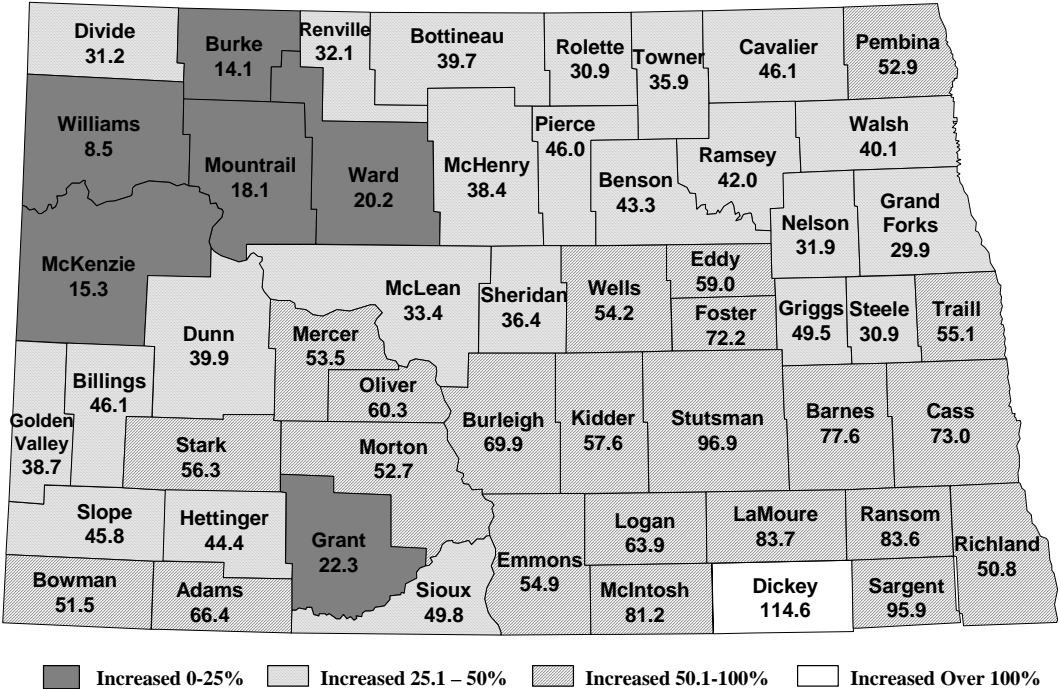
**Figure 5. Percent Change in Estimated Market Value of Cropland, 2006-2007**



**Five-year Trend: Market Value of Cropland**

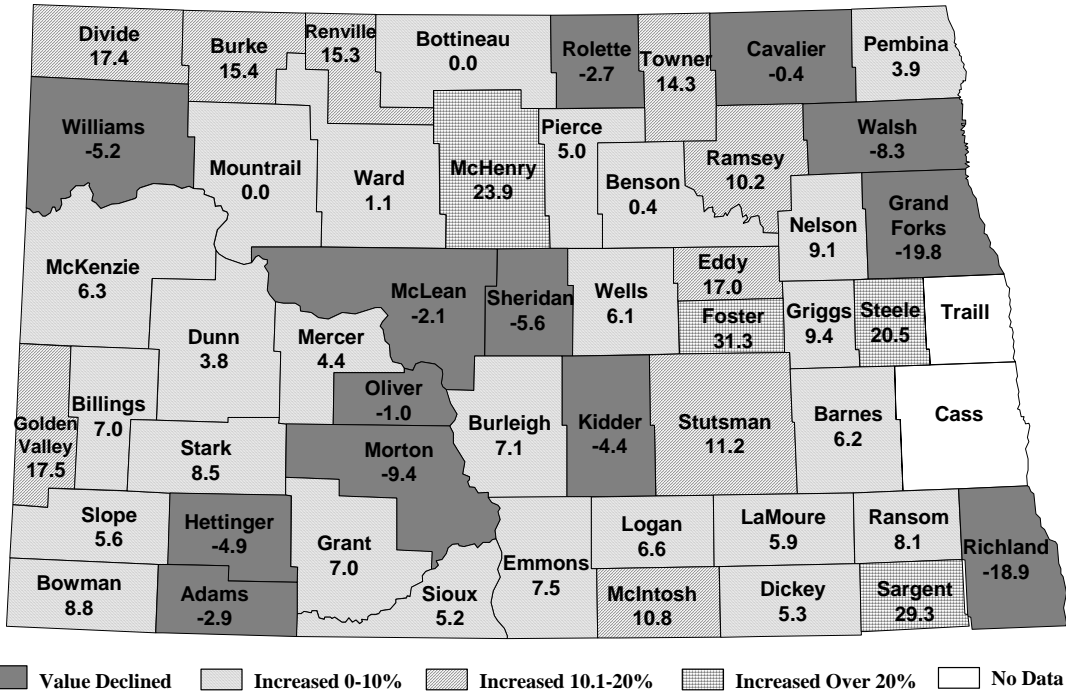
The estimated market value of cropland reported by NASS has increased significantly more than the increase in productivity value over the 2002-2007 time period. Dickey County market value increased 114.6 percent. Other counties with large increases in market values were Stutsman at 96.9 percent, Sargent at 95.9 percent, LaMoure at 83.7 percent, Ransom at 83.6 percent and McIntosh at 81.2 percent. Percentage changes in cropland market values are shown in Figure 6.

**Figure 6. Percentage Change in Estimated Market Value of Cropland, 2002-2007**



The change in market value of pasture was highly variable across the state as well. The survey indicated market values declined in 13 counties with the largest decline being a negative 19.8 percent in Grand Forks County followed by Richland County at 18.9 percent lower. Twenty-three counties had increases in value of less than 10 percent, 9 counties showed increases between 10 and 20 percent and 4 counties increased greater than 20 percent. The greatest increases were in Foster at 31.3 percent, Sargent at 29.3 percent, McHenry at 23.9 percent and Steele at 20.5 percent. Values were reported unchanged in two counties and no report was provided for Cass and Traill counties due to insufficient data. Percentage changes in the market value of pasture are shown in Figure 7.

**Figure 7. Percent Change in Estimated Market Value of Pasture, 2006-2007**

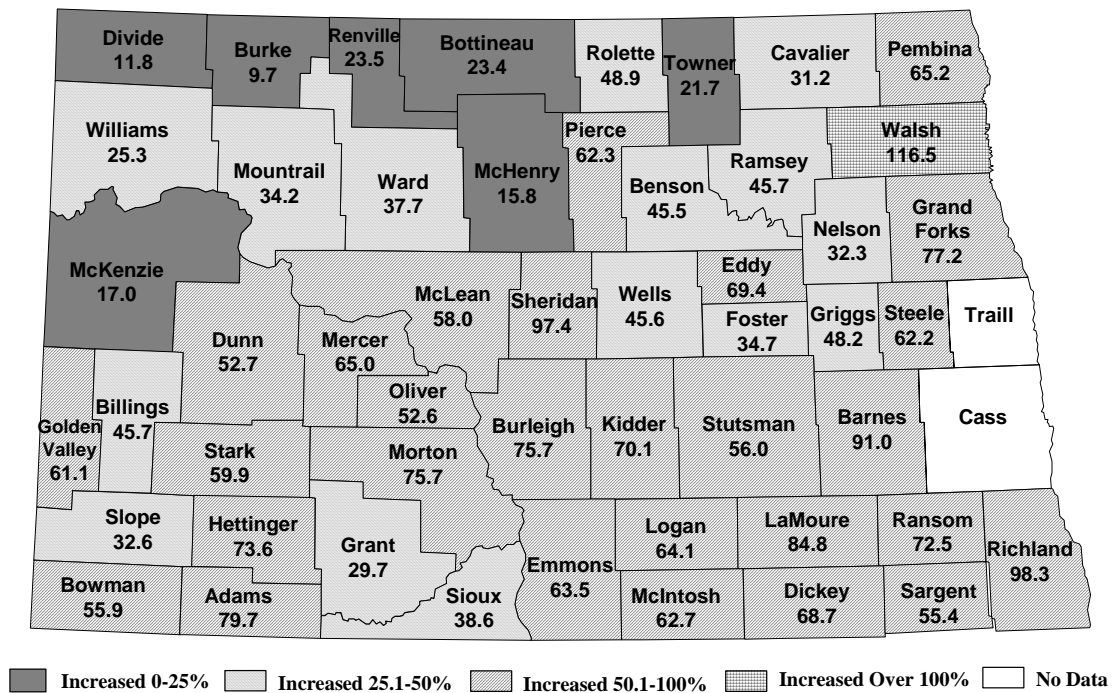




## Five-year Trend: Market Value of Pasture

Since 2002, market value estimates of pasture have shown considerable strength across most of the state. See Figure 8. Cass and Traill counties had insufficient data so no comparison could be made. The amount of increase was variable throughout the state. Changes in value ranged from Walsh County with an increase of 116.5 percent on the high end to a 9.7 percent increase on the low end in Burke County.

**Figure 8. Percentage Change in Estimated Market Value of Pasture, 2002-2007**



## CONCLUSIONS

Valuation of all agricultural land in North Dakota, based on productivity, increased by 0.79 percent or \$2.25 per acre for the 2007 assessment as compared to the previous year. The average value of all agricultural land increased in all but 10 counties. The increases were all less than 5 percent.

The average value of cropland in North Dakota increased by \$1.37 per acre or 0.36 percent. The largest increase was 3.86 percent in Slope County. Non-cropland values for all counties increased by 5.93 percent from the previous year. The production of grazing units is held constant for non-cropland, only the value per unit changes 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 2007 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 7.325 percent..

The cost of production index increased by 2.328 points over the previous year to 118.3824. The cost of production index reduced the landowner share of gross returns by 15.53 percent before this value was 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.

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