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RESULTS OF THE NORTH DAKOTA LAND VALUATION MODEL FOR THE 2019 AGRICULTURAL REAL ESTATE ASSESSMENT

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ABSTRACT

This report summarizes the 2019 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 2019 valuation of agricultural land for real estate tax assessment. The average value for all agricultural land in a county 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.

The average value per acre of all agricultural land in North Dakota increased by **2.72** percent from 2018 to 2019 based on the value of production. The formula cost of production index value used in the 2019 analysis was **209.56**. The formula capitalization rate was **4.51** percent. The capitalization rate had a larger effect on higher valuations compared to recent years.

Cropland value increased, on average, **2.64** percent. Across individual counties, the cropland valuation ranged from a decrease of 4.29 percent to an increase of 6.99 percent. County values had small increases and decreases depending on crop mix and cropland to non-cropland percentages. Non-cropland values increased **5.52** percent. Generally, valuations for counties with a higher percentage of livestock increased partly due to increased calf prices for the current year replacing the lower oldest year in the data set.

Changes in market value are included for comparison. Market value data are from the annual County Rents and Prices survey conducted by the North Dakota Department of Trust Lands.

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

RESULTS OF THE NORTH DAKOTA LAND VALUATION MODEL FOR THE 2018 AGRICULTURAL REAL ESTATE ASSESSMENT

Ronald Haugen[1]

NORTH DAKOTA LAND VALUATION MODEL

North Dakota 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 calculated at 30 percent of gross returns for all crops except sugar beets and potatoes, 20 percent for sugar beets and potatoes, 25 percent for non-cropland and 50 percent of the dryland rate for irrigated land.

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 (Agri-Bank, 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 was not to be lower than 8.3 percent. The 2009 Legislature amended the capitalization rate formula to set a minimum of 8.0 percent for 2009, 7.7 percent for 2010 and 7.4 percent for 2011. The minimum rate was allowed to sunset after 2011.

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The capitalization rate was calculated based on the formula for the 2019 analysis. This rate was 4.51 percent. Lowering the capitalization rate from 4.67 percent for 2018 to 4.51 percent increases the values by **3.55** percent without any other changes. The interest rate for the latest year in the data set (2017) was 4.78%. This replaces the rate for 2005 which was 6.37%.

Cost of Production Index

Beginning with the analysis for the 1999 assessment, a cost of production index was incorporated into 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, Interest, Taxes and Wage Rates* from the *Prices Paid Index Annual Average* published by the USDA 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 index used for 2019 increased from 204.41 in 2018 to 209.56, for a one-year change of 5.15 points. This change in the cost of production index had the effect of reducing calculated land values by **2.52** percent from 2018.

The index value used in the 2019 analysis was 209.56, which resulted in a reduction in the landowner share of gross returns of 52.28 percent. The landowner share of gross returns is the amount that is capitalized to determine the land values. Therefore, land values are 52.28 percent lower than they would have been if the cost of production index was not included in the model.

Combined Effect

The cost of production index and the capitalization rate apply equally to all land in all counties. The net impact of the change in value from the previous year for these two factors was to increase land values by **1.03** percent. Therefore, any change in county values more or less than a positive 1.03 percent from the 2018 values is due primarily to an increase or decrease in productivity. Values may also be impacted by a shift in the ratio between cropland and non-cropland acres.

RESULTS: ALL AGRICULTURAL LAND VALUE

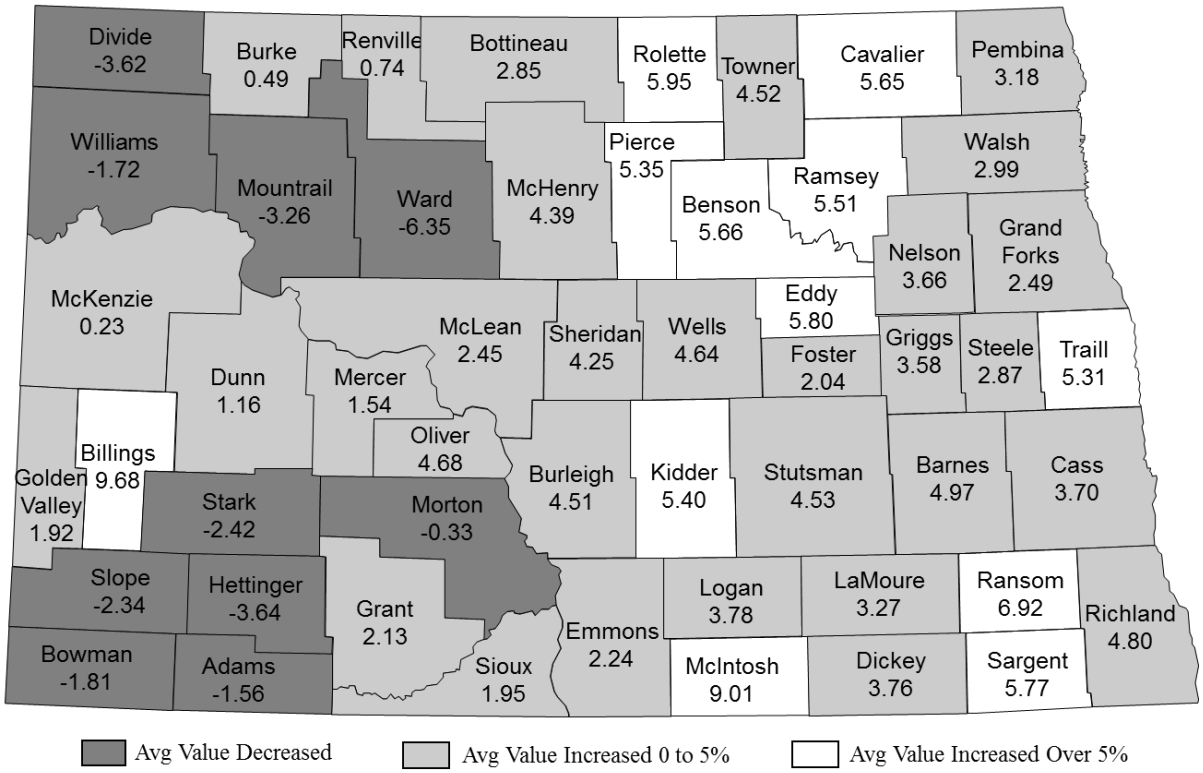
The value for all agricultural land is a weighted average of cropland and non-cropland in each county. Calculated values for cropland generally are three to five times the value of non-cropland in each county. Therefore, a shift in acres between these two categories will alter the “all land” value even 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 most years. 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.

Comparison to Previous Year: All Agricultural Land Value

Valuation of all agricultural land in North Dakota, for the 2019 assessment compared to the 2018 assessment, increased by 2.72 percent or $17.37 per acre over the previous year. The largest percentage increase occurred in Billings County at 9.68 percent. The largest decrease was in Ward County with a 6.35 percent decrease. Values decreased in ten counties, values increased from zero to 5 percent in thirty-one counties, values increased more than 5 percent in twelve counties. Results are shown in Figure 1.

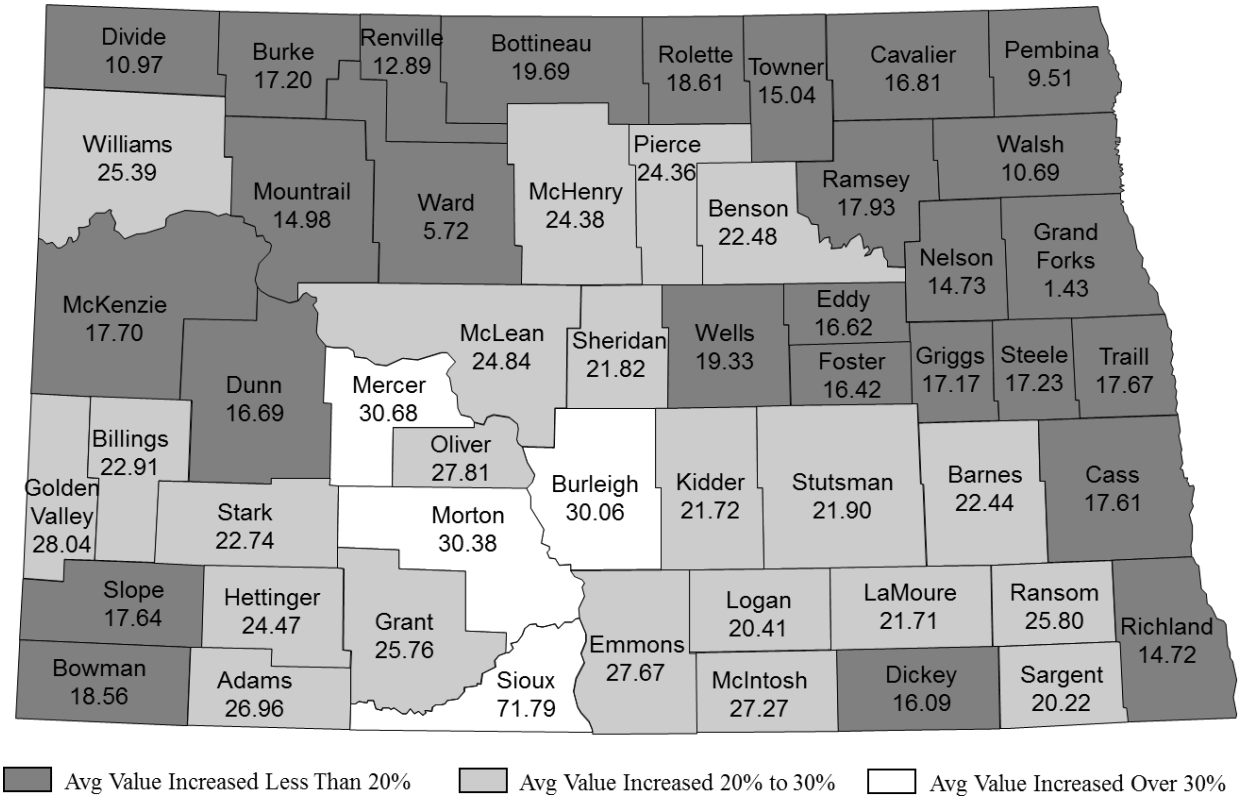
Figure 1. Percent Change in Average Productivity Value of All Agricultural Land, 2018-2019



Five-Year Trend: All Agricultural Land Value

Estimated values for 2019 were compared with values estimated for 2014 to see how they have changed over time. The average value for all agricultural land in North Dakota increased 17.88 percent from 2014 to 2019, with a dollar value of $99.54. The highest value increase was 71.79 percent in Sioux County partly due to a large acreage shift the previous year. The smallest increase over this 5-year period was in Grand Forks County at 1.43 percent. Twenty-seven counties increased less than 20 percent. Twenty-two counties increased between 20 and 30 percent. Four counties increased more than 30 percent. The percentage change in value by county is shown in Figure 2.

Figure 2. Percent Change in Average Productivity Value of All Agricultural Land, 2014-2019



RESULTS: CROPLAND PRODUCTIVITY VALUE

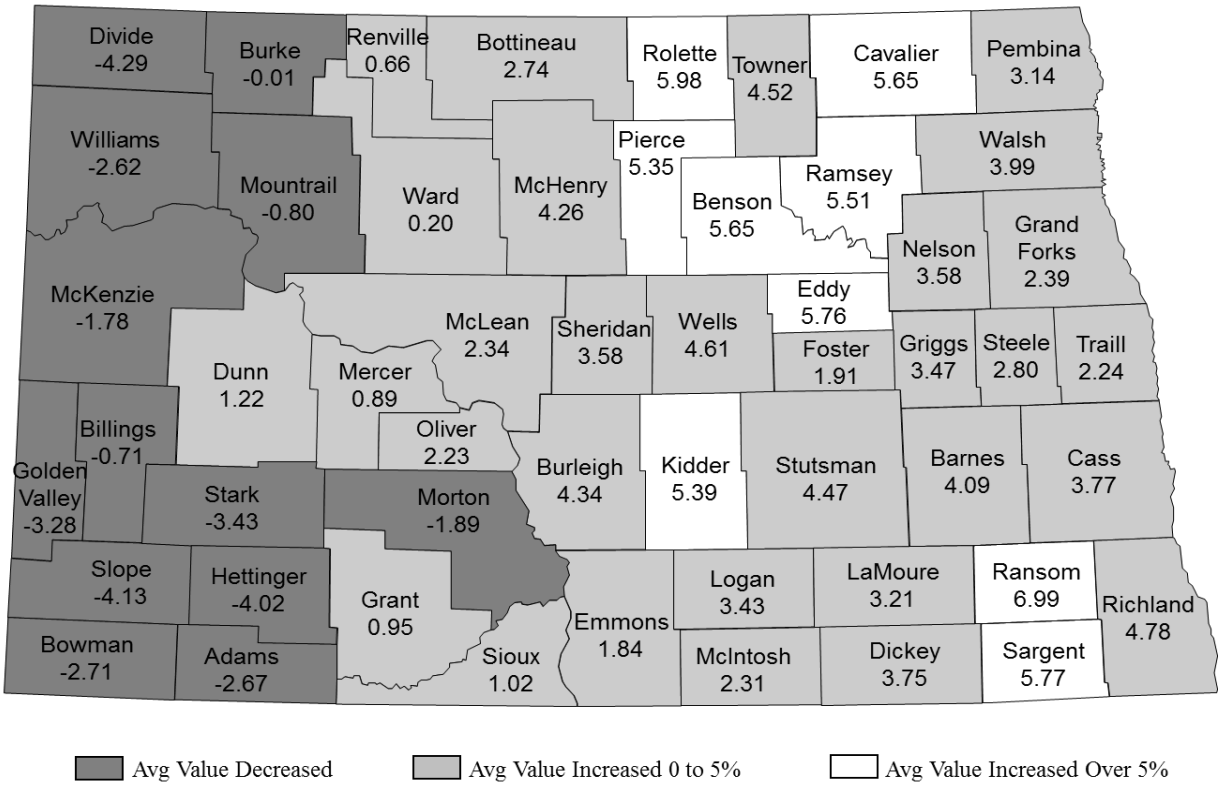
Changes in the capitalization rate and cost of production index impact all counties equally. The capitalization rate used for the 2019 analysis was 4.51 percent and the cost of production index used was 209.56 percent. The change in the capitalization rate increased values in all counties by

3.55 percent. The increase in the cost of production index resulted in a downward shift in land values in all counties of 2.52 percent from 2018. The net effect of these two components is that cropland values in all counties increased by 1.03 percent before any changes in productivity were included. Therefore, increases and decreases in gross revenue were primarily due to crop yields, crop prices and crop mix.

Comparison to Previous Year: Cropland Productivity Value

The value of cropland increased an average of $22.73 per acre across the state for 2019 compared to 2018. This was an average increase of 2.64 percent over 2018. Ransom County had the largest increase at 6.99 percent. Divide County had the largest decrease at 4.29 percent. Values decreased in thirteen counties, these counties were in the western part of the state. Values increased from zero to 5 percent in thirty-one counties. Values increased more than 5 percent in nine counties. The values are shown in Figure 3.

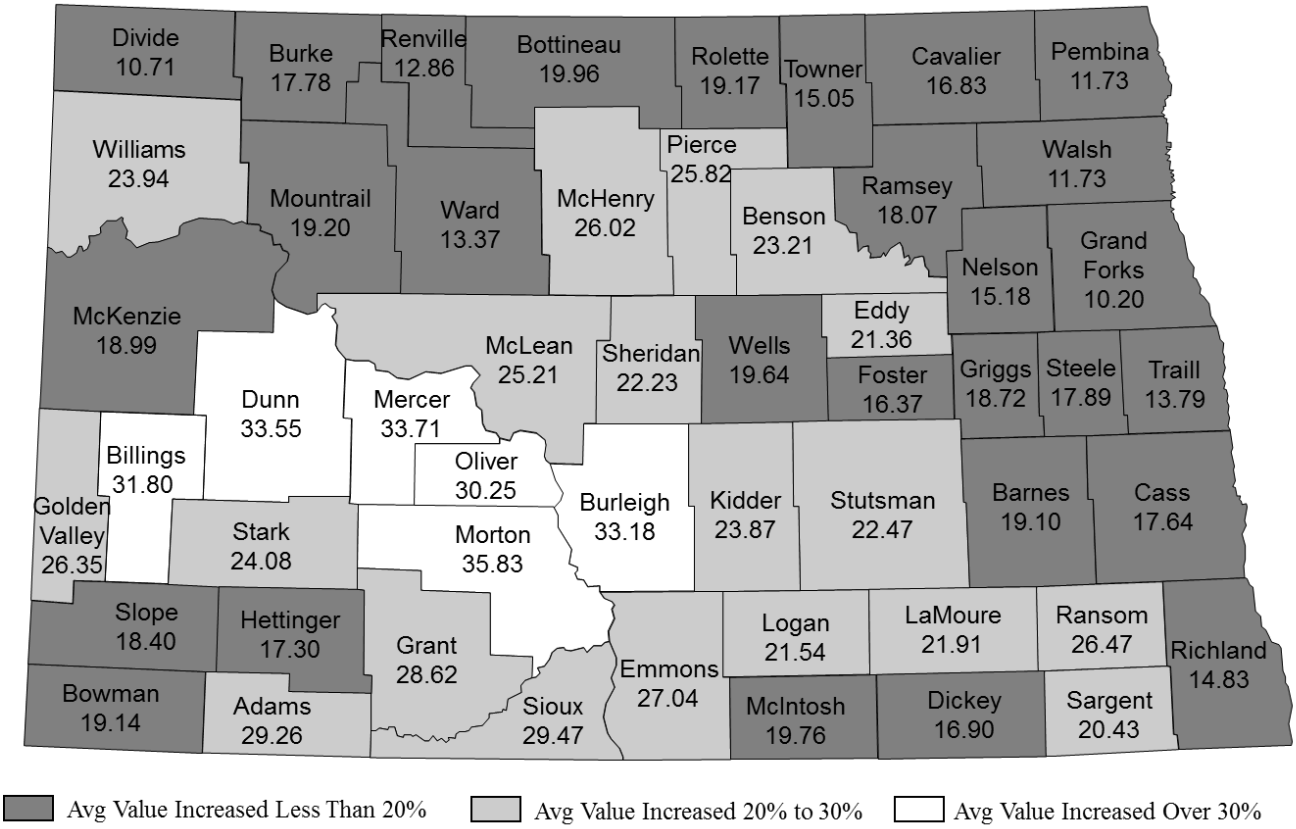
Figure 3. Percent Change in Average Productivity Value of Cropland, 2018-2019



Five-year Trend: Cropland Productivity Value

Cropland value based on the value of production has increased in all counties from 2014 to 2019. The average value of North Dakota cropland was 18.17 percent higher in 2019 than in 2014 with an increase of $135.63 per acre. The largest increase was in Morton County at 35.83 percent. The smallest increase in cropland value over this 5-year period was in Grand Forks County at 10.20 percent. Twenty-eight counties increased less than 20 percent. Nineteen counties increased between 20 and 30 percent. Six counties increased over 30 percent. The rate of increase has been highly variable across the state, however larger increases are shown in the southwest. The percentages can be seen in Figure 4.

Figure 4. Percent Change in Average Productivity Value of Cropland, 2014-2019



RESULTS: NON-CROPLAND PRODUCTIVITY VALUE

The value of non-cropland (grazing land) based on the value of production increased by 5.52 percent or $8.07 per acre for the 2019 assessment. The value of non-cropland is derived by calculating the value of the beef cattle 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, provided no acre changes were reported by the county. Therefore, all counties experienced the same percentage increase in non-cropland values relative to 2018.

Comparison to Previous Year: Non-Cropland Productivity Value

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 $107.34 for the 2017 marketing year, the most recent year added to the data set. This is up from $89.25 from the previous year. This is a significant increase. The AUM value used to determine productivity, is based on the average of the latest ten years after dropping the high and low years. Therefore, the average gross return is 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 2007, the year rolled out of the data set for this analysis, was $73.57. As a result, the increase in value for non-cropland is due to a combination of an increase in the value of production, an increase in the cost of production index (which causes a decrease in value) and a decrease in the capitalization rate.

Five-year Trend: Non-Cropland Value

Non-cropland values increased $19.83 per acre from 2014 to 2019 assessments. This is a 14.74 percent average increase for the state over this five-year period. All counties experienced the same change. Note that the 2014 data year (2016 assessments) was the high non-cropland year for all counties and was removed from the calculation for all counties.

CAPITALIZED AVERAGE ANNUAL VALUES PER ACRE BY COUNTY

Two tables are provided to display county values for 2018 and 2019. North Dakota Capitalized Average Annual Values per Acre by County for 2018 are shown in Table 1. North Dakota Capitalized Average Annual Values per Acre by County for 2019 are shown in Table 2.

Table 1. North Dakota Capitalized Average Annual Values Per Acres by County for 2018 Assessments

County	Cropland	Non-cropland	All Agricultural Land
Adams	541.97	136.40	388.06
Barnes	1,058.24	189.51	926.17
Benson	849.00	167.88	698.80
Billings	457.82	127.84	212.66
Bottineau	742.61	162.53	644.96
Bowman	520.77	112.63	370.22
Burke	647.97	149.46	495.44
Burleigh	698.72	149.89	449.68
Cass	1,285.65	192.72	1,226.31
Cavalier	981.16	164.67	868.69
Dickey	1,084.37	189.08	857.32
Divide	611.13	148.61	497.73
Dunn	562.31	136.19	274.31
Eddy	733.19	168.52	543.68
Emmons	894.65	148.39	592.67
Foster	963.60	162.31	820.08
Golden Valley	580.94	111.78	317.49
Grand Forks	1,164.45	189.29	993.69
Grant	563.17	136.83	345.12
Griggs	908.78	165.31	735.71
Hettinger	717.99	135.76	610.56
Kidder	589.94	151.39	333.30
LaMoure	1,183.94	195.50	1,053.92
Logan	726.34	149.25	447.71
McHenry	619.49	161.46	478.29
McIntosh	770.24	148.39	532.25
McKenzie	549.25	136.62	302.12
McLean	827.41	148.82	723.49
Mercer	667.02	135.97	437.05
Morton	693.79	136.40	371.39
Mountrail	698.07	148.39	469.95
Nelson	729.76	164.45	628.39
Oliver	757.60	136.83	392.47
Pembina	1,365.31	197.00	1,256.45
Pierce	751.61	161.46	620.38
Ramsey	813.28	169.16	660.01
Ransom	1,101.93	186.30	829.48
Renville	783.94	161.88	735.93
Richland	1,347.54	191.43	1,167.25
Rolette	712.42	164.24	624.61
Sargent	1,118.42	191.01	977.94
Sheridan	702.14	148.39	487.33
Sioux	560.81	136.40	326.27
Slope	609.64	124.41	353.43
Stark	642.18	137.04	453.57
Steele	1,221.63	168.09	1,070.79
Stutsman	941.76	186.94	730.87
Towner	824.20	168.74	792.98
Traill	1,422.70	191.01	1,333.65
Walsh	1,152.25	176.23	977.65
Ward	776.02	148.39	628.77
Wells	939.40	162.96	798.12
Williams	671.73	148.82	482.26
State	859.53	146.25	638.88

Table 2. North Dakota Capitalized Average Annual Values Per Acres by County for 2019 Assessments

County	Cropland	Non-cropland	All Agricultural Land
Adams	527.49	144.12	382.02
Barnes	1,101.55	200.00	972.19
Benson	897.00	177.16	738.34
Billings	454.55	134.81	233.25
Bottineau	762.97	171.40	663.35
Bowman	506.65	119.07	363.51
Burke	647.89	157.65	497.89
Burleigh	729.05	158.09	469.94
Cass	1,334.15	203.33	1,271.73
Cavalier	1,036.59	173.84	917.75
Dickey	1,125.06	199.56	889.52
Divide	584.92	156.76	479.72
Dunn	569.18	143.68	277.50
Eddy	775.39	177.83	575.23
Emmons	911.09	156.54	605.95
Foster	982.04	171.18	836.79
Golden Valley	561.86	117.96	323.57
Grand Forks	1,192.24	199.78	1,018.45
Grant	568.51	144.35	352.48
Griggs	940.35	174.50	762.07
Hettinger	689.14	143.24	588.36
Kidder	621.73	159.65	351.31
LaMoure	1,221.95	206.43	1,088.36
Logan	751.22	157.65	464.64
McHenry	645.90	170.29	499.28
McIntosh	788.03	156.76	580.19
McKenzie	539.47	144.35	302.82
McLean	846.78	157.21	741.18
Mercer	672.95	143.68	443.76
Morton	680.71	143.90	370.15
Mountrail	692.46	156.54	454.62
Nelson	755.88	173.61	651.42
Oliver	774.50	144.35	410.85
Pembina	1,408.20	207.98	1,296.37
Pierce	791.80	170.29	653.59
Ramsey	858.09	178.49	696.38
Ransom	1,178.94	196.67	886.92
Renville	789.14	170.73	741.41
Richland	1,411.97	202.00	1,223.29
Rolette	754.99	173.17	661.80
Sargent	1,182.93	201.55	1,034.39
Sheridan	727.27	156.76	508.05
Sioux	566.52	144.12	332.64
Slope	584.48	131.26	345.17
Stark	620.18	144.57	442.60
Steele	1,255.88	177.38	1,101.52
Stutsman	983.81	197.12	764.01
Towner	861.42	178.05	828.86
Traill	1,454.55	201.55	1,404.44
Walsh	1,198.23	186.03	1,006.84
Ward	777.61	156.54	588.86
Wells	982.71	171.84	835.15
Williams	654.10	156.98	473.96
State	882.26	154.32	656.25

MARKET VALUE OF FARMLAND IN NORTH DAKOTA

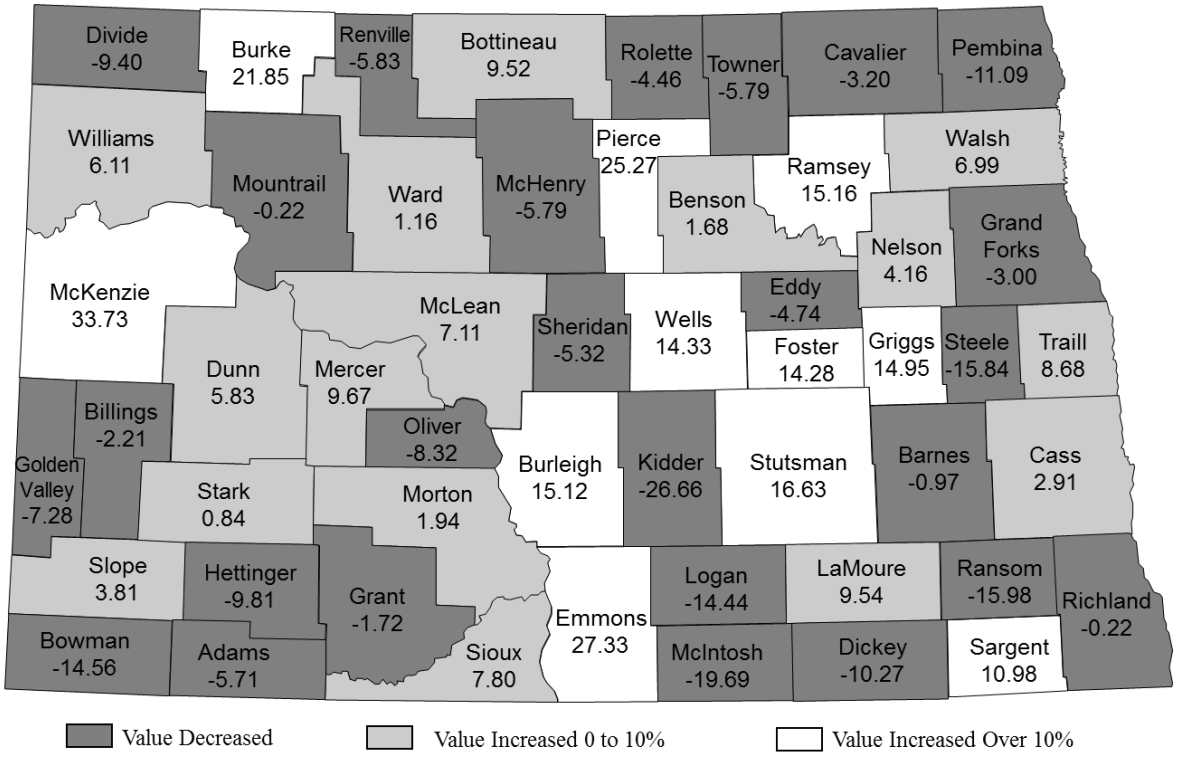
The North Dakota Land Valuation Model was designed to estimate the value of agricultural land dependent solely on the revenue generated from the production of crops and beef cattle. The results of this model were not intended to reflect market value. Market value of farm land is influenced by numerous 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 Department of Trust Lands conducted the annual County Rents and Prices survey of farmers and ranchers to obtain rental rates and the price of rented land. The survey is done for cropland, pasture and hay land. This survey is available at: https://land.nd.gov/Surface/RentSurvey

Comparison to Previous Year: Market Value of Cropland

The data from the 2019 survey are compared with the 2018 survey for cropland. Changes in market values by county for cropland varied widely across the state. This survey showed values declined in twenty-six counties, sixteen counties increased from zero to 10 percent. However, greater than 10 percent increases were reported in eleven counties. At the opposite end of the price change spectrum were increases of 33.73 percent in McKenzie County, and a 26.66 percent decrease in Kidder County. Percentage changes in market value for cropland by county are shown in Figure 5.

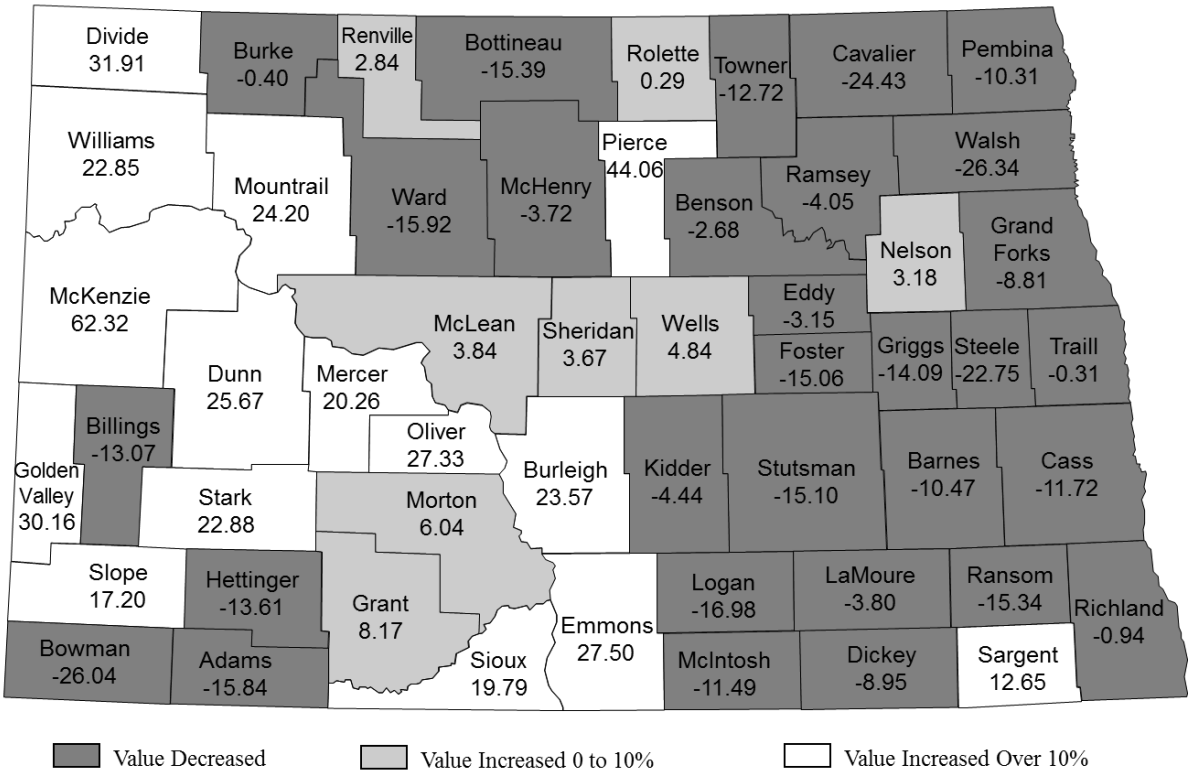
Figure 5. Percent Change in Estimated Market Value of Cropland, 2018-2019



Five-year Trend: Market Value of Cropland

The estimated market value of cropland has increased significantly more than the increase in productivity value from 2014 to 2019. Estimated market values decreased in thirty counties, eight counties increased from zero to 10 percent. However, greater than 10 percent increases were reported in fifteen counties. The largest reported increase was 62.32 percent in McKenzie County. Walsh County had the biggest decrease at 26.34 percent. Percentage changes in cropland market values by county are shown in Figure 6.

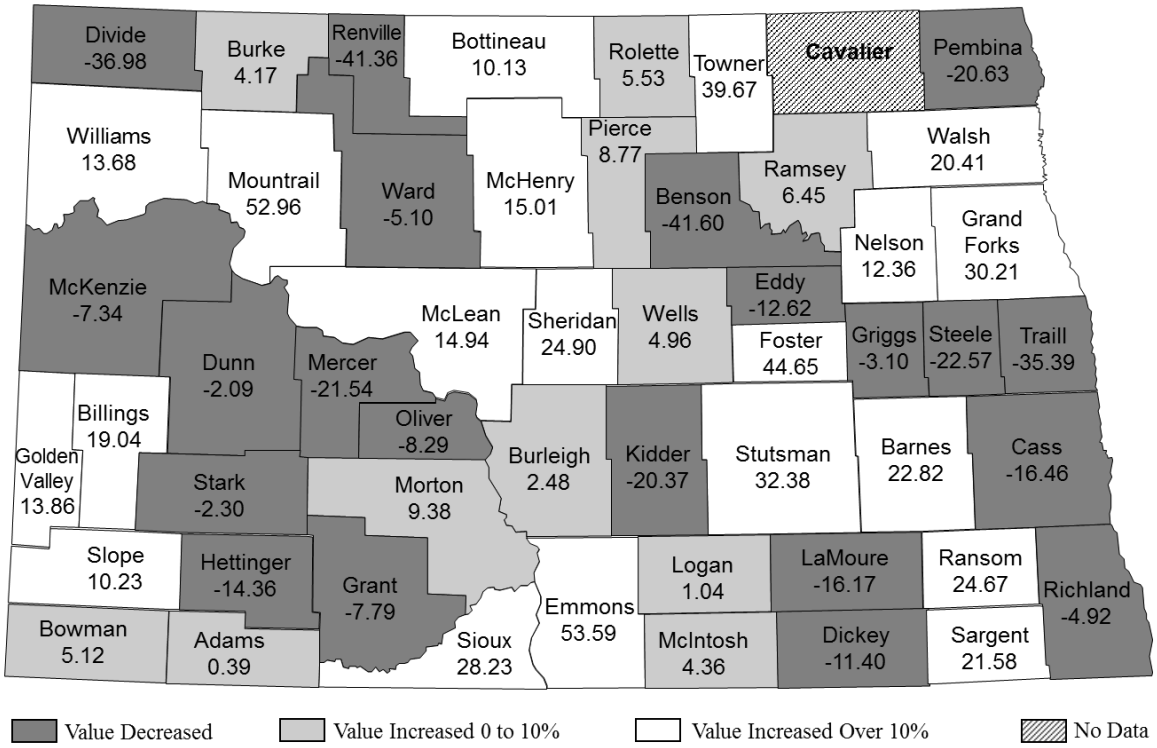
Figure 6. Percentage Change in Estimated Market Value of Cropland, 2014-2019



Comparison to Previous Year: Market Value of Pasture

The data from the 2019 survey are compared with the 2018 survey for pasture. The change in market value of pasture was highly variable across the state. This survey showed values declined in twenty-one counties, eleven counties increased from zero to 10 percent. However, greater than 10 percent increases were reported in twenty counties. There was insufficient data in one county, so a percentage could not be calculated. At the opposite end of the price change spectrum were increases of 53.59 percent in Emmons County, and a 41.60 percent decrease in Benson County. Percentage changes in the market value of pasture are shown in Figure 7.

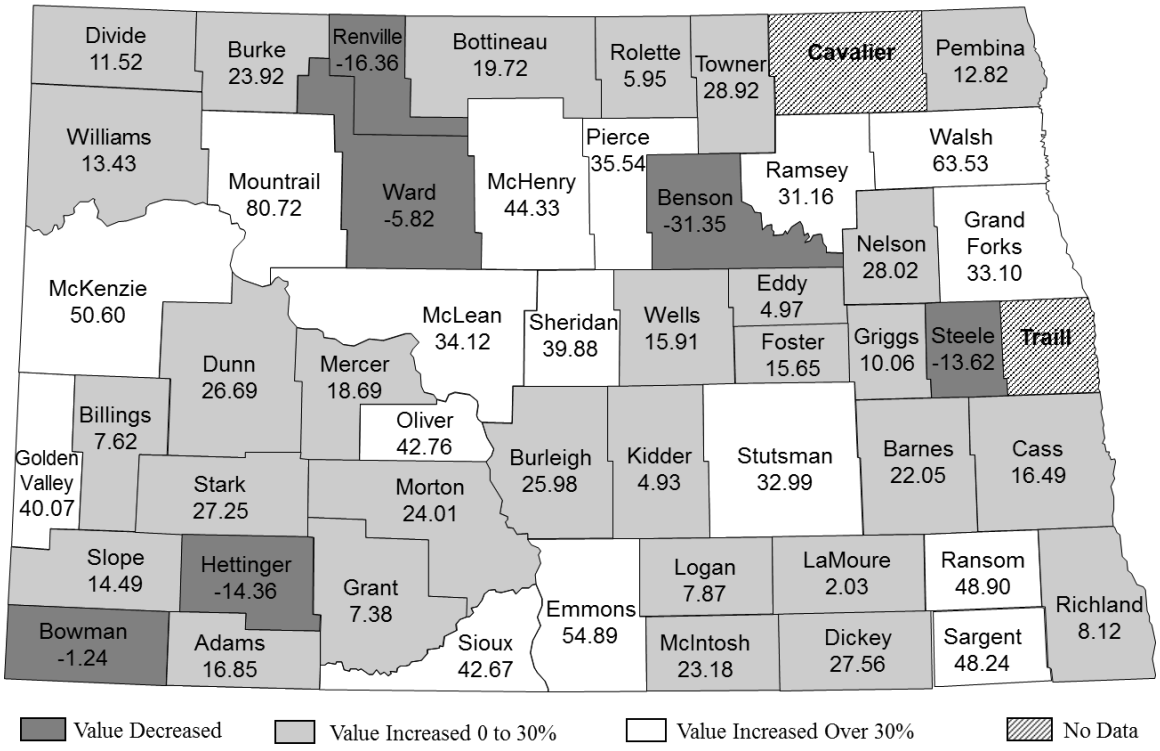
Figure 7. Percent Change in Estimated Market Value of Pasture, 2018-2019



Five-year Trend: Market Value of Pasture

Since 2011, market value estimates of pasture have increased significantly across the state. Increases have been extremely variable across county lines. This survey showed values declined in six counties, twenty-nine counties increased from zero to 30 percent. However, greater than 30 percent increases were reported in sixteen counties. There was insufficient data in two counties, so a percentage could not be calculated. At the opposite end of the price change spectrum were increases of 80.72 percent in Mountrail County, and a 31.35 percent decrease in Benson County. Percentage changes in the market value of pasture are shown in Figure 8.

Figure 8. Percentage Change in Estimated Market Value of Pasture, 2014-2019



CONCLUSIONS

Valuation of all agricultural land in North Dakota, based on productivity, increased by 2.72 percent or $17.37 per acre for the 2019 assessment as compared to the previous year. The average value was slightly positive to slightly negative for all counties. The largest percentage increase occurred in Billings County at 9.68 percent. The greatest decrease was Ward County with a 6.35 percent decrease.

Valuation of cropland in North Dakota increased $22.37 per acre. This was a 2.64 percent increase over 2018. The change in crop revenue and crop mix caused a change in cropland values from a negative 4.29 percent in Divide County to a positive 6.99 percent in Ransom County.

Non-cropland values for all counties increased by 5.52 percent or $8.07 per acre from the previous year. The production of grazing units is held constant for non-cropland, only the values per unit 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 2019 analysis was the legislative formula rate of 4.51 percent down from 4.67 in 2018.

The cost of production index increased 5.15 points to 209.56 over the previous year of 204.41. The cost of production index reduced the landowner share of gross returns by 52.28 percent before this value was capitalized.

The analysis for 2019 added data from 2017 and dropped data from 2007. The crop revenue for most counties has been considerably higher since 2007 than prior years. Ten years of data are included in the analysis with the high and low years dropped to calculate an Olympic average. The decline in the capitalization rate resulted in an increase of 3.55 percent in values. This change was offset by the increase in the cost of production index. The cost of production index decreased values in all counties by 2.52 percent. This is a net 1.03 percent increase from both these factors.

Changes in market value of cropland and pasture, based on the survey of farmers and ranchers by the North Dakota Department of Trust Lands is included for comparison. Reported market values changed considerably more than productivity values from 2018 to 2019. However, market value changes were both negative and positive across the state. This is expected due to the additional factors that influence market values along with the current weakness in land markets since the decline in crop prices began in 2013.

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