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RESULTS OF THE NORTH DAKOTA LAND VALUATION MODEL FOR THE 2017 AGRICULTURAL REAL ESTATE ASSESSMENT

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ABSTRACT

This report summarizes the 2017 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 2017 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 **0.81** percent from 2016 to 2017 based on the value of production. The formula cost of production index value used in the 2017 analysis was **197.18**. The formula capitalization rate was **4.78** percent.

Cropland value increased, on average, **0.74** percent. Across individual counties, the cropland valuation ranged from a decrease of 2.06 percent to an increase of 4.54 percent. County values had small increases and decreases depending on crop mix and cropland to non-cropland percentages. Non-cropland values increased **1.57** percent. This was due to the price received for calves and cull cows. Generally, counties with more livestock increased, while counties with more cropland decreased.

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 2017 AGRICULTURAL REAL ESTATE ASSESSMENT

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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 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 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.The capitalization rate calculated according to the formula was used for the 2017 analysis. This rate was 4.78 percent. Lowering the capitalization rate from 4.82 percent to 4.78 percent increases the values by **0.84** percent without any other changes. The interest rate for the latest year in the data set (2015) was 4.07%. This replaces the rate for 2003 which was 4.50%.

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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 2017 increased from 186.89 in 2016 to 197.18, for a one-year change of 10.29 points. This change in the cost of production index had the effect of reducing calculated land values by **5.22** percent from 2016.

The index value used in the 2017 analysis was 197.18, which resulted in a reduction in the landowner share of gross returns of 49.28 percent. The landowner share of gross returns is the amount that is capitalized to determine the land values. Therefore, land values are 49.28 percent lower than they would have been if the cost of production index was not included in the model.

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.

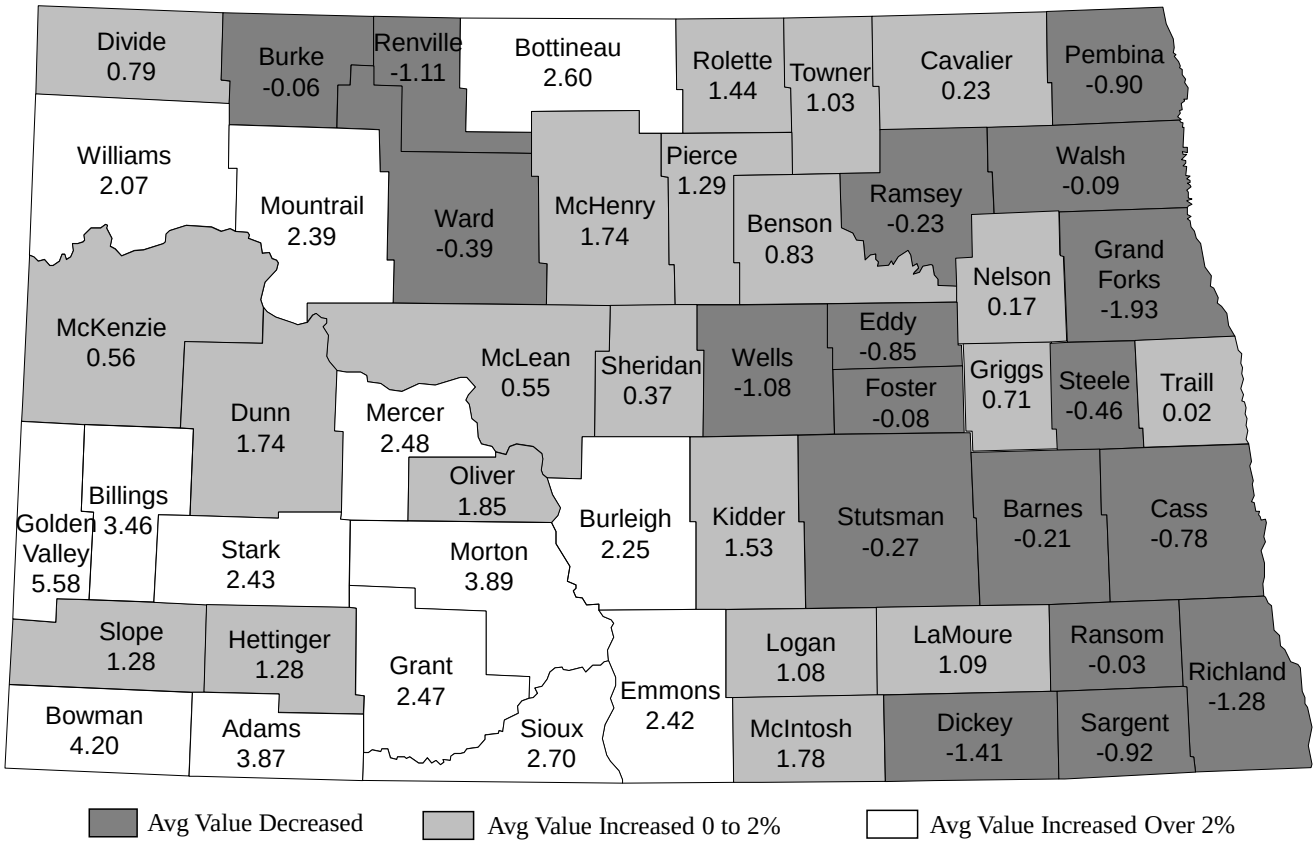
The cost of production index and the capitalization rate apply equally to all land in all counties. The net impact of the change in value from the previous year for these two factors was to lower land values by **4.38** percent. Therefore, any change in county values more or less than a negative 4.38 percent from 2016 values is due primarily to an increase or decrease in productivity. Values may be impacted by a shift in the ratio between cropland and non-cropland.

Comparison to Previous Year: All Agricultural Land Value

For the 2017 tax year, there were no major shifts in acreage of cropland or non-cropland reported by the counties with the exception of Golden Valley County which had a large shift of an increase of 16,174 acres of cropland and an increase of 3,818 acres of non-cropland.

Valuation of all agricultural land in North Dakota, for the 2017 assessment compared to the 2016 assessment, increased by 0.81 percent or $4.95 per acre over the previous year. The largest percentage increase occurred in Golden Valley County at 5.58 percent. The smallest increase was in Grand Forks County with a 1.93 percent decrease. Values decreased in eighteen counties, values increased from zero to 1 percent in nine counties, values increased between 1 and 2 percent in twelve counties, and values increased more than 2 percent in fourteen counties. Results are shown in Figure 1.

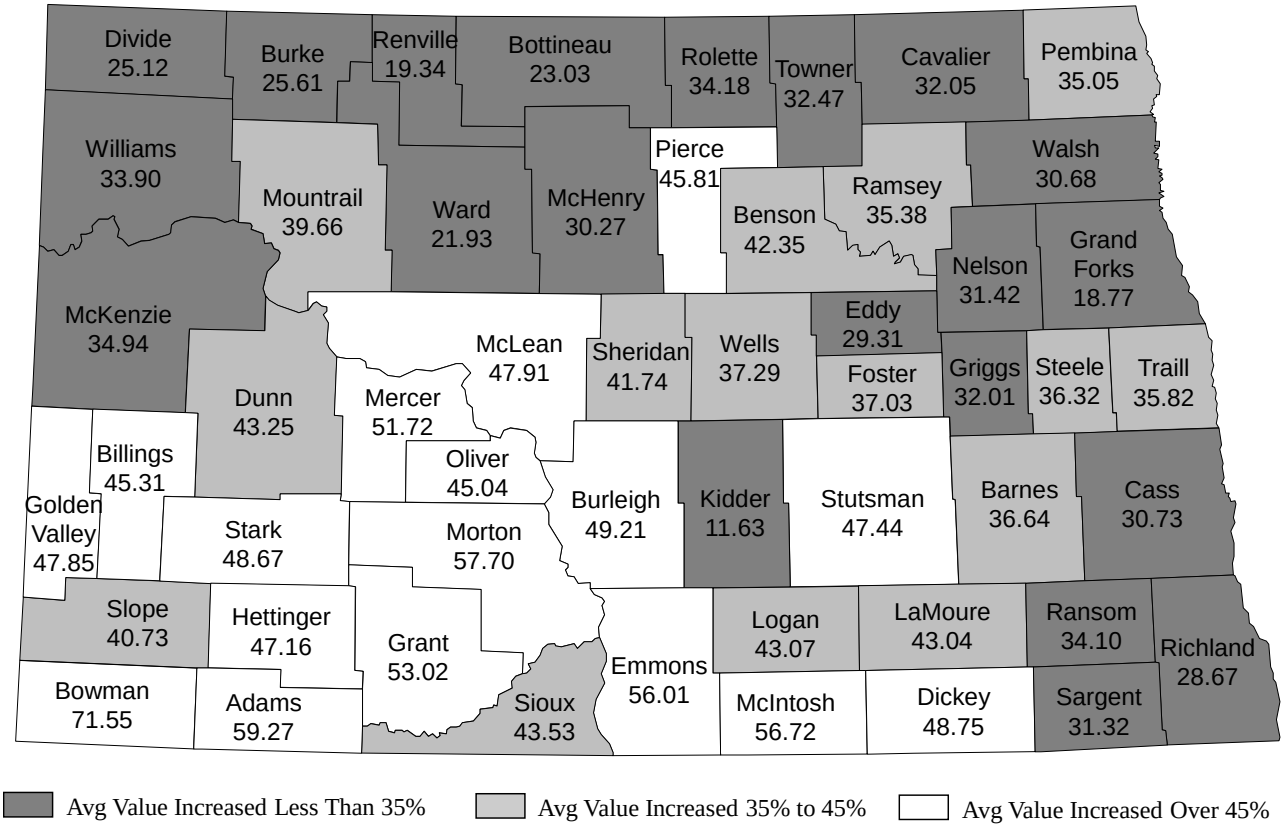
Figure 1. Percent Change in Average Productivity Value of All Agricultural Land, 2016-2017



Five-Year Trend: All Agricultural Land Value

Estimated values for 2017 were compared with values estimated for 2012 to see how they have changed over time. The average value for all agricultural land in North Dakota increased 36.74 percent from 2012 to 2017. The values increased by 71.55 percent in Bowman County. The smallest increase over this 5-year period was in Kidder County at 11.63 percent. The increase in most counties was between 35 and 45 percent in 2017 relative to 2012. The percentage change in value by county is shown in Figure 2.

Figure 2. Percent Change in Average Productivity Value of All Agricultural Land, 2012-2017



RESULTS: CROPLAND PRODUCTIVITY VALUE

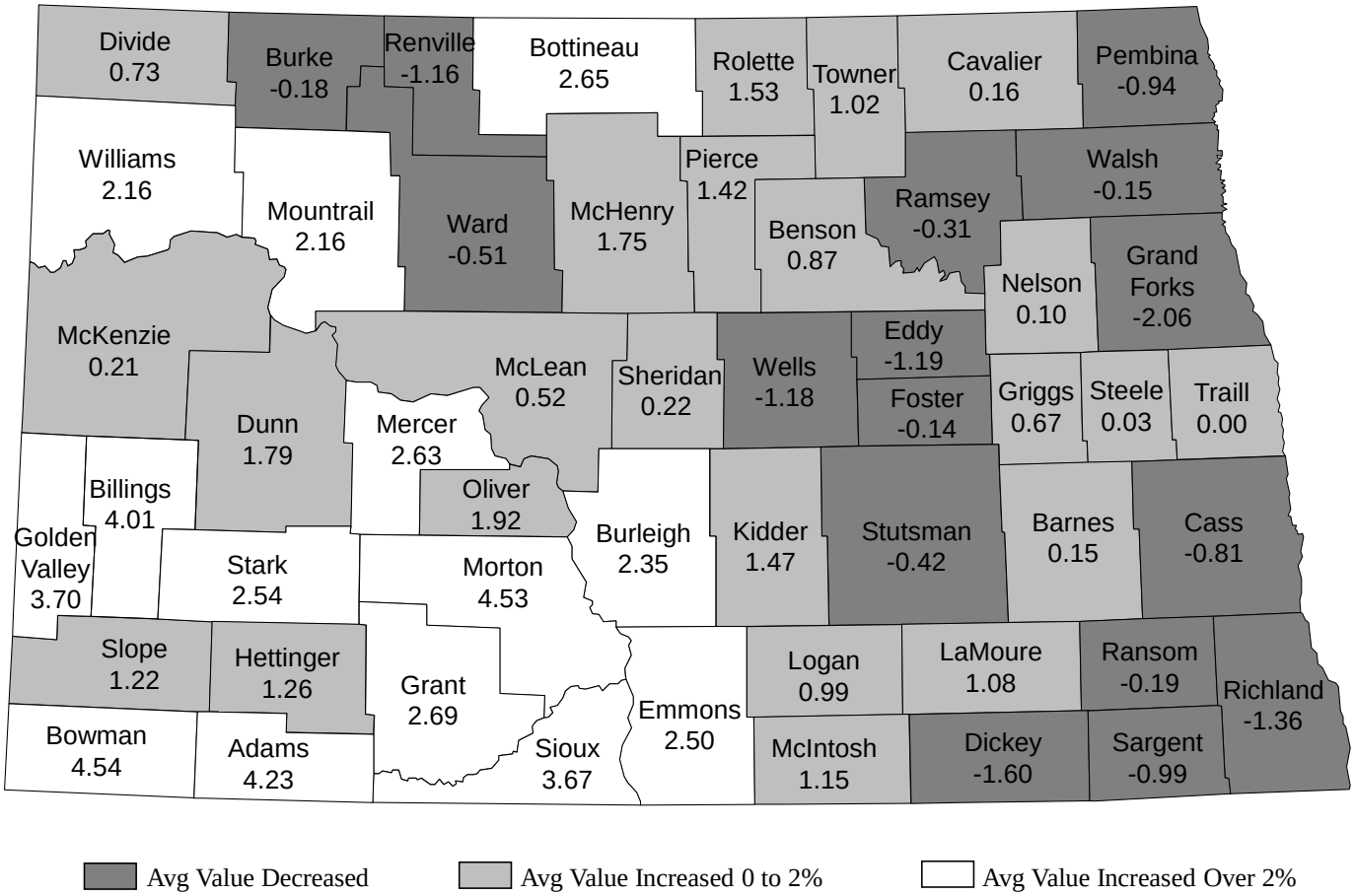
Changes in the capitalization rate and cost of production index impact all counties equally. The capitalization rate used for the 2017 analysis was 4.78 percent and the cost of production index used was 196.18 percent. The change in the capitalization rate increased values in all counties by 0.84 percent. The increase in the cost of production index resulted in a downward shift in land values in all counties of 5.22 percent from 2015. The net effect of these two components is that

cropland values in all counties declined by 4.38 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 $6.11 per acre across the state for 2017 compared to 2016. This was an average increase of 0.74 percent over 2016. This was the smallest increase in years. Cropland value increased the most in Bowman County at 4.54 percent. Grand Forks County had the largest decrease with a 2.06 percentage drop. See Figure 3.

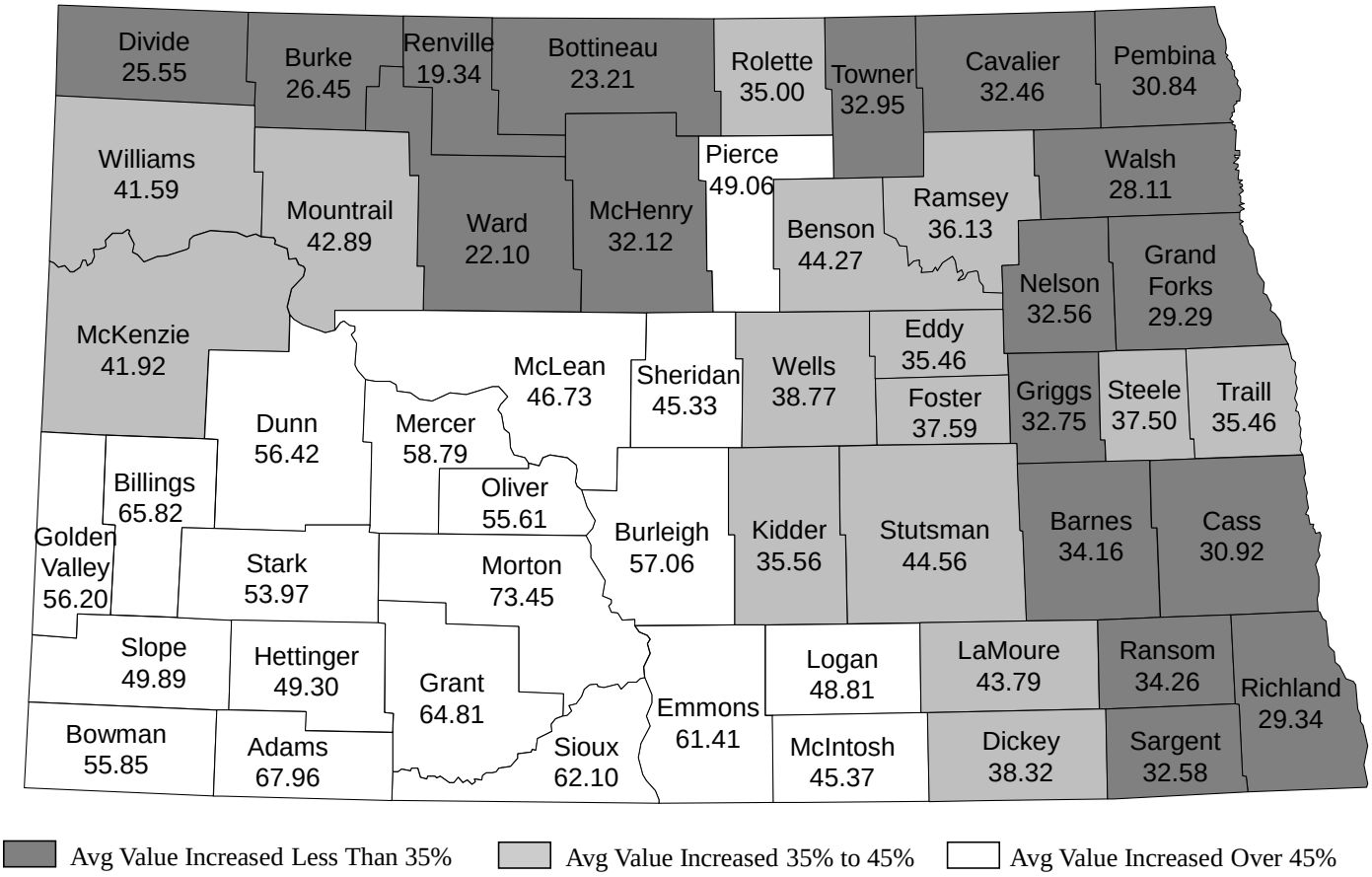
Figure 3. Percent Change in Average Productivity Value of Cropland, 2016-2017



Five-year Trend: Cropland Productivity Value

Cropland value based on the value of production has increased in all counties from 2012 to 2017. The average value of North Dakota cropland was 38.19 percent higher in 2017 than in 2012. The smallest increase in cropland value over this 5-year period was in Renville County at 19.34 percent. The largest increase was in Morton County at 73.45 percent. The rate of increase has been highly variable across the state but larger increases are shown in the southwest part of the state. The percentages can be seen in Figure 4.

Figure 4. Percent Change in Average Productivity Value of Cropland, 2012-2017



RESULTS: NON-CROPLAND PRODUCTIVITY VALUE

The value of non-cropland (grazing land) based on the value of production increased by 1.57 percent or $2.25 per acre for the 2017 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, provided no acre changes were reported by the county. Therefore, all counties experienced the same percentage increase in non-cropland values relative to 2016.

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 $129.05 for the 2015 marketing year, the most recent year added to the data set. This is down from $171.85 from the previous year. 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 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 2005, the year rolled out of the data set for this analysis, was $84.79. As a result, the increase in value for non-cropland is due to a combination of an to the increase in the value of production, an increase in the cost of production index and a decrease in the capitalization rate.

Five-year Trend: Non-Cropland Value

Non-cropland values increased $23.90 per acre from 2012 to 2017 assessments. This is a 19.60 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 2016 and 2017. North Dakota Capitalized Average Annual Values per Acre by County for 2016 are shown in Table 1. North Dakota Capitalized Average Annual Values per Acre by County for 2017 are shown in Table 2.

Table 1. North Dakota Capitalized Average Annual Values Per Acres by County for 2016 Assessments

County	Cropland	Non-cropland	All Agricultural Land
Adams	511.83	134.02	368.45
Barnes	1,010.82	186.18	890.99
Benson	805.00	164.73	664.19
Billings	428.01	125.52	220.40
Bottineau	680.08	159.54	592.50
Bowman	502.28	110.79	357.89
Burke	618.88	146.68	475.46
Burleigh	650.00	147.10	421.69
Cass	1,248.76	189.21	1,190.39
Cavalier	955.19	161.83	845.11
Dickey	1,056.64	185.68	835.67
Divide	580.91	145.85	474.24
Dunn	524.27	133.61	279.73
Eddy	712.24	165.56	529.08
Emmons	852.70	145.64	557.81
Foster	920.75	159.34	784.70
Golden Valley	541.49	109.75	292.28
Grand Forks	1,157.05	185.89	986.99
Grant	541.70	134.44	333.40
Griggs	864.11	162.45	708.75
Hettinger	687.34	133.40	549.88
Kidder	563.49	148.55	320.13
LaMoure	1,109.13	192.12	988.58
Logan	699.59	146.68	432.64
McHenry	571.16	158.51	443.95
McIntosh	737.34	145.85	508.02
McKenzie	531.74	134.23	293.79
McLean	787.14	146.27	689.00
Mercer	608.09	133.61	402.62
Morton	628.22	133.82	342.30
Mountrail	664.32	145.64	447.81
Nelson	709.34	161.41	611.06
Oliver	695.44	134.23	365.34
Pembina	1,366.18	193.36	1,256.90
Pierce	715.77	158.51	592.61
Ramsey	781.74	165.98	634.93
Ransom	1,041.08	182.99	785.18
Renville	753.94	158.92	708.02
Richland	1,313.28	187.97	1,137.69
Rolette	694.19	161.20	610.72
Sargent	1,075.31	187.55	940.83
Sheridan	677.18	145.85	471.04
Sioux	531.95	134.02	220.76
Slope	600.41	122.20	347.91
Stark	591.49	134.65	420.92
Steele	1,170.95	164.94	1,032.14
Stutsman	898.76	183.40	698.89
Towner	799.59	165.56	769.38
Traill	1,375.73	187.55	1,289.82
Walsh	1,149.17	173.03	974.55
Ward	745.23	145.64	604.55
Wells	924.07	159.96	785.04
Williams	614.94	146.06	416.27
State	829.25	143.57	613.78

Table 2. North Dakota Capitalized Average Annual Values Per Acres by County for 2017 Assessments

County	Cropland	Non-cropland	All Agricultural Land
Adams	533.47	136.19	382.70
Barnes	1,012.32	189.21	889.13
Benson	812.00	167.57	669.72
Billings	445.19	127.41	228.02
Bottineau	698.12	162.13	607.93
Bowman	525.10	112.55	372.93
Burke	617.78	149.16	475.18
Burleigh	665.27	149.58	431.17
Cass	1,238.70	192.47	1,181.07
Cavalier	956.69	164.44	847.03
Dickey	1,039.75	188.70	823.89
Divide	585.15	148.12	478.00
Dunn	533.68	135.77	284.61
Eddy	703.77	168.20	524.59
Emmons	874.06	148.12	571.30
Foster	919.46	161.92	784.10
Golden Valley	561.51	111.51	308.60
Grand Forks	1,133.26	188.91	967.90
Grant	556.28	136.61	341.64
Griggs	869.87	165.06	713.81
Hettinger	699.37	135.56	559.46
Kidder	566.95	151.05	322.94
LaMoure	1,121.13	195.19	999.31
Logan	706.49	148.95	437.30
McHenry	581.17	161.09	451.66
McIntosh	745.82	148.12	517.07
McKenzie	532.85	136.40	295.43
McLean	791.21	148.54	692.79
Mercer	624.06	135.77	412.61
Morton	656.69	136.19	355.63
Mountrail	678.66	147.91	458.53
Nelson	710.04	164.02	612.07
Oliver	708.79	136.40	372.11
Pembina	1,353.35	196.65	1,245.57
Pierce	725.94	161.09	600.26
Ramsey	779.29	168.83	633.45
Ransom	1,039.12	185.98	784.92
Renville	745.19	161.51	700.14
Richland	1,295.40	191.00	1,123.14
Rolette	704.81	163.81	619.54
Sargent	1,064.64	190.59	932.22
Sheridan	678.66	148.12	472.80
Sioux	551.46	136.19	226.71
Slope	607.74	124.06	352.35
Stark	606.49	136.82	431.13
Steele	1,171.34	167.57	1,027.37
Stutsman	894.98	186.40	697.01
Towner	807.74	168.20	777.27
Traill	1,375.73	190.59	1,290.04
Walsh	1,147.49	175.94	973.69
Ward	741.42	147.91	602.17
Wells	913.18	162.55	776.56
Williams	628.24	148.33	424.89
State	835.36	145.82	618.73

MARKET VALUE OF FARMLAND IN NORTH DAKOTA

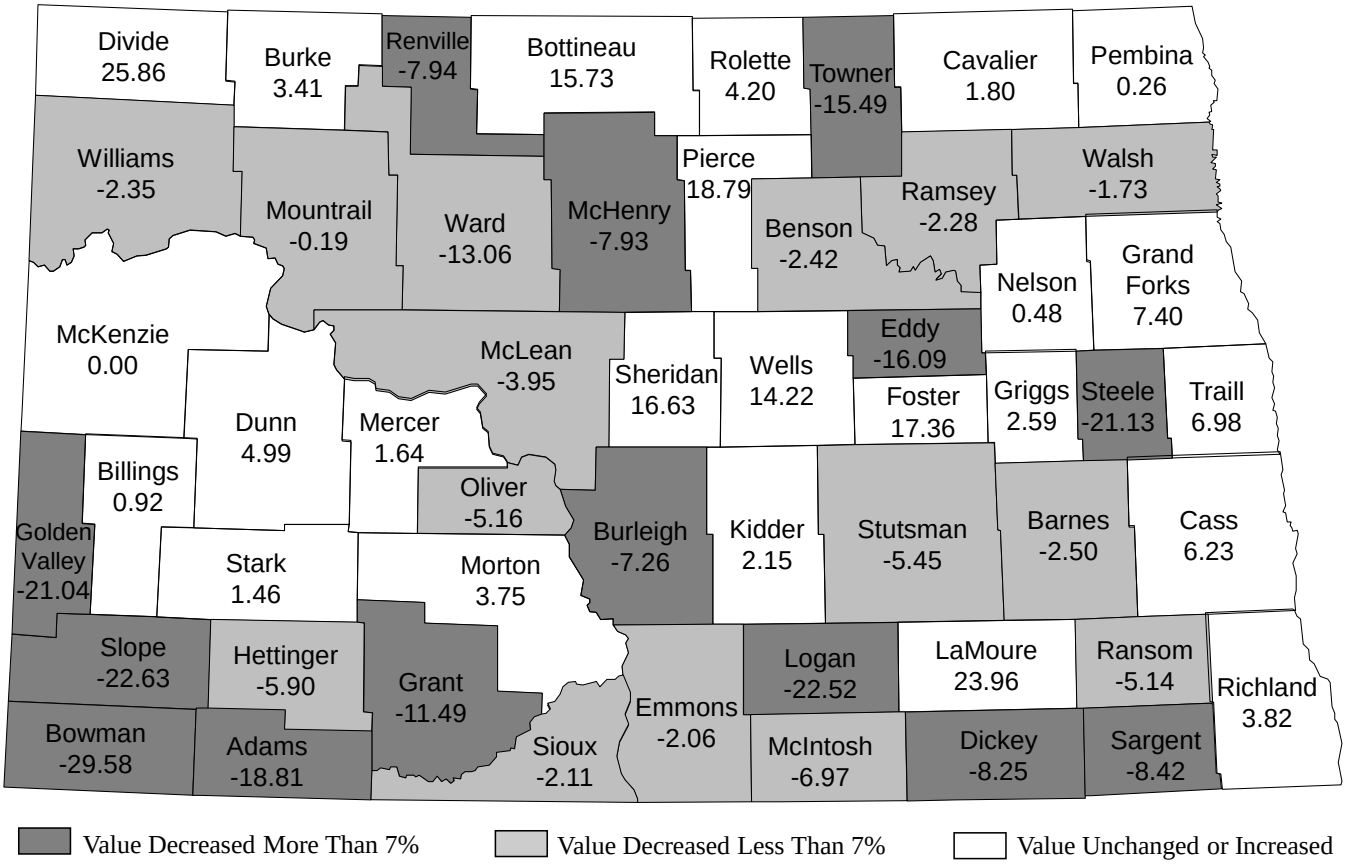
The North Dakota Land Valuation Model was designed to estimate the value of agricultural land dependent solely on the revenue generated from the production of crops and beef cattle. The results of this model were not intended to reflect market value. Market value of farm land is influenced by numerous 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 Agricultural Statistics Service (NASS) conducts an annual survey of farmers and ranchers to obtain rental rates and the value of rented land. The survey is done for cropland and pasture. This survey is funded by the North Dakota Department of Trust Lands and is available at: https://land.nd.gov/surface/rentsurvey.aspx

Comparison to Previous Year: Market Value of Cropland

The data from the 2017 survey are compared with the 2016 survey for cropland. Changes in market values by county for cropland varied widely across the state. This survey showed values declined in thirty counties, nineteen by less than 10 percent. However, greater than 10 percent decreases were reported in eleven counties. At the opposite end of the price change spectrum were increases of 25.86 percent in Divide County, and 23.96 percent in LaMoure County. Percentage changes in market value for cropland by county are shown in Figure 5.

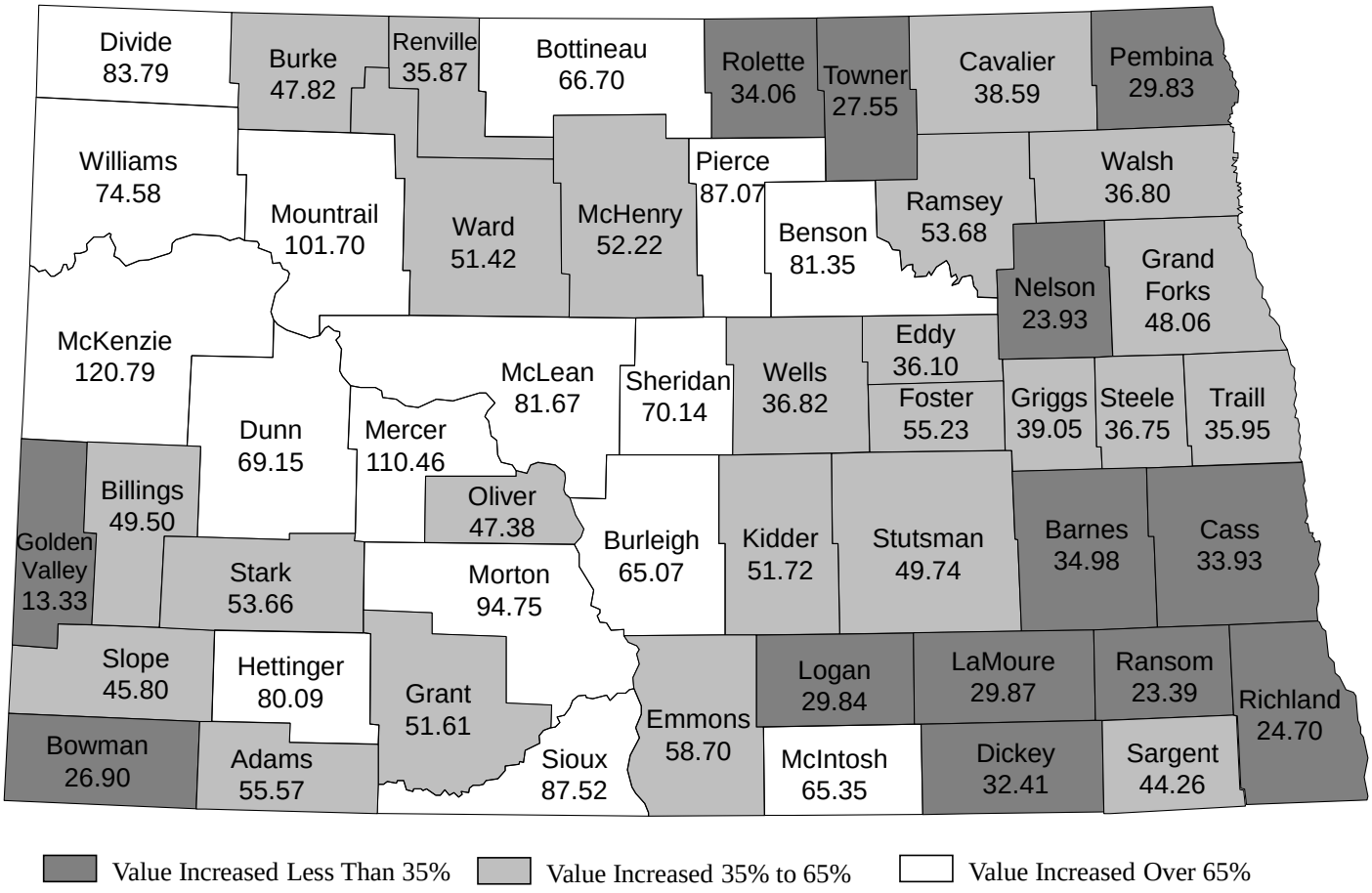
Figure 5. Percent Change in Estimated Market Value of Cropland, 2016-2017



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 from 2012 to 2017. Cropland values increased by more than 100 percent in three counties in the western part of the state. Estimated market values increased less than 50 percent in twenty-eight counties. The largest reported increase was 120.79 percent in McKenzie County. Golden Valley County had the smallest increase of 13.33 percent. Percentage changes in cropland market values are shown in Figure 6.

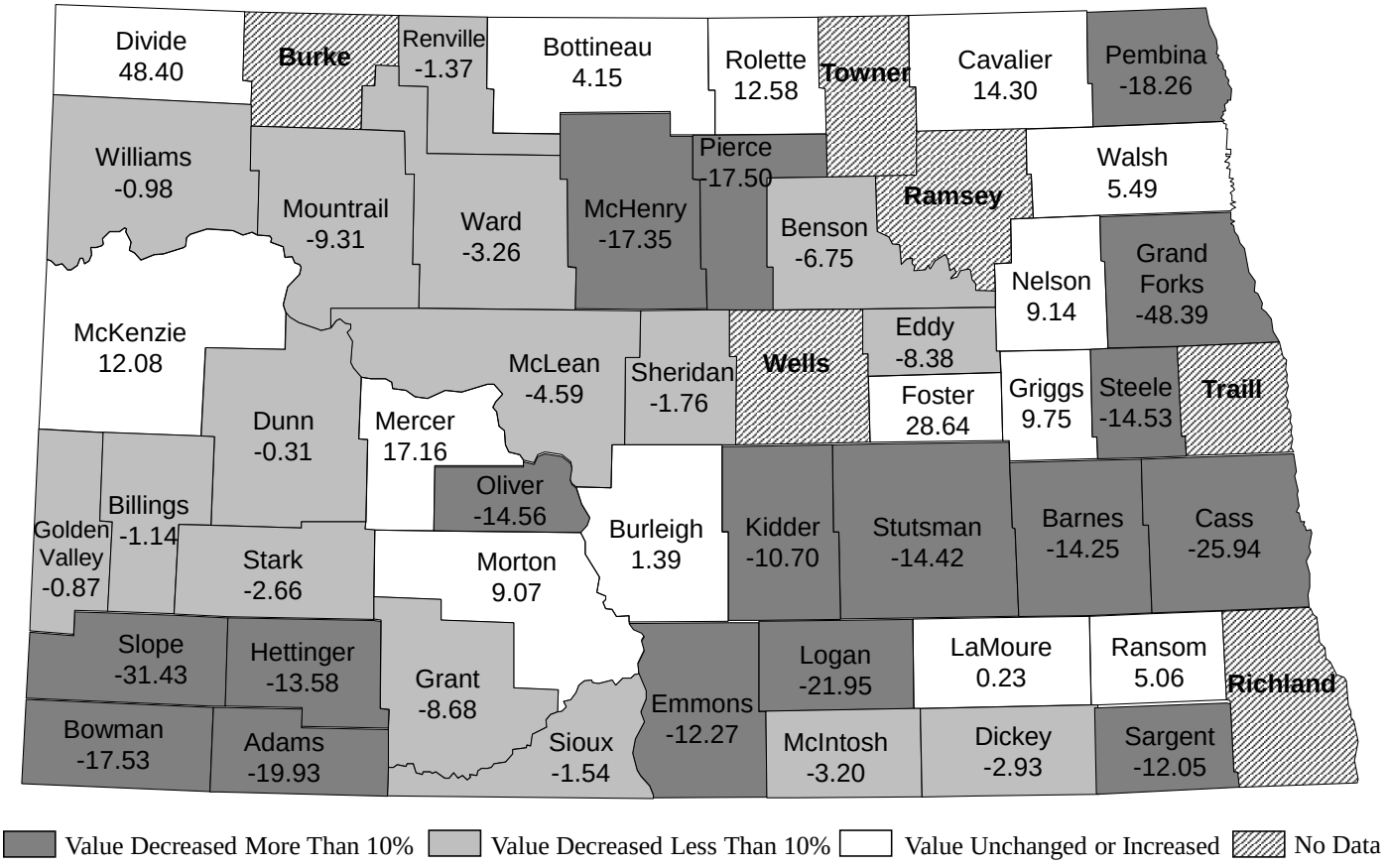
Figure 6. Percentage Change in Estimated Market Value of Cropland, 2012-2017



Comparison to Previous Year: Market Value of Pasture

The change in market value of pasture was highly variable across the state. Thirty-four counties reported a decrease in value from 2016. Pasture values increased less than 10 percent in seven counties. Values increased more than 10 percent in six counties. There was insufficient data in six counties, so a percentage could not be calculated. Percentage changes in the market value of pasture are shown in Figure 7.

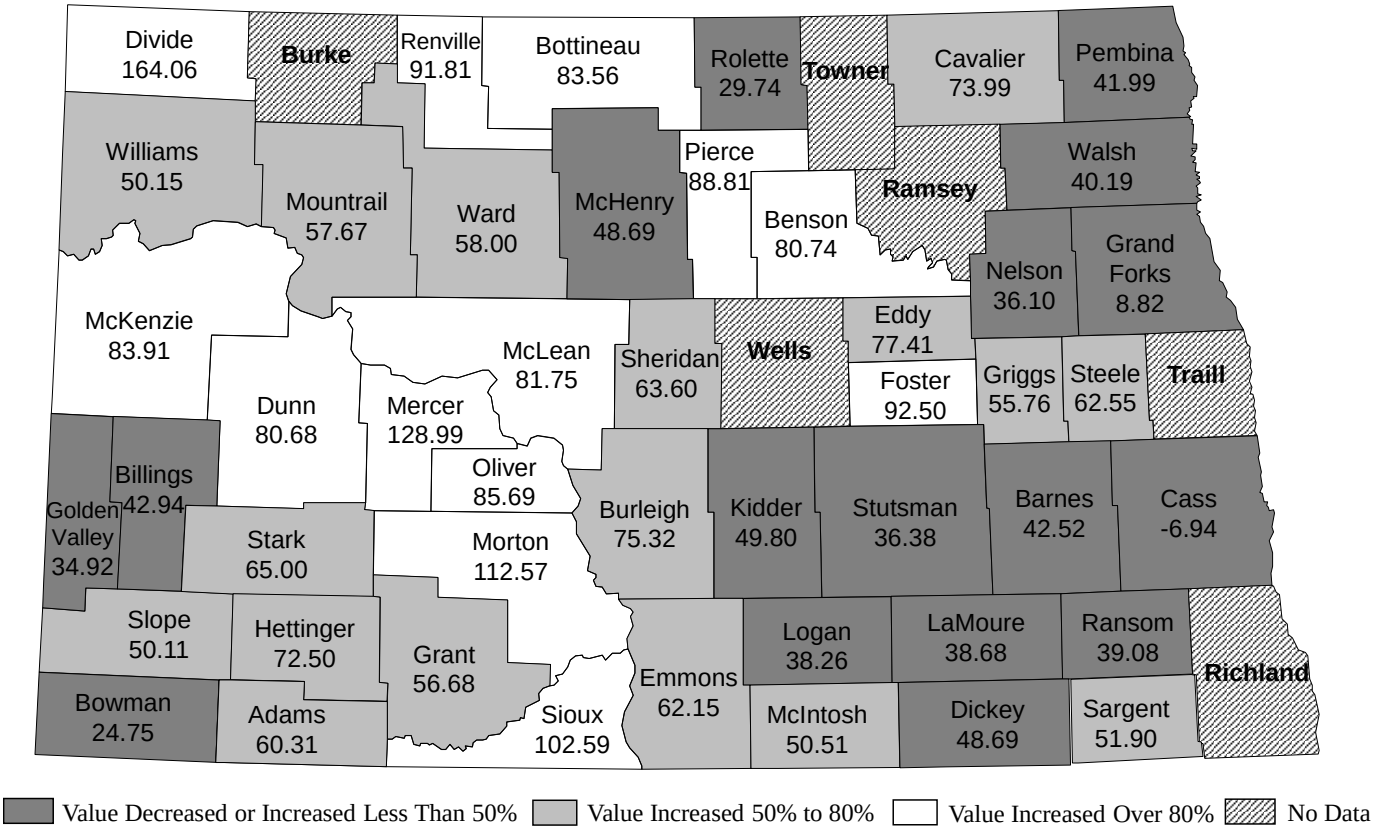
Figure 7. Percent Change in Estimated Market Value of Pasture, 2016-2017



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. Four counties showed increases greater than 100 percent. Values increased between 50 and 100 percent in twenty-six counties. Sixteen counties showed increases of less than 50 percent. Cass County was the only county that showed a decrease, which was a 6.94% decrease. There was insufficient data in six counties, so a percentage could not be calculated. Percentage changes in the market value of pasture are shown in Figure 8.

Figure 8. Percentage Change in Estimated Market Value of Pasture, 2012-2017



CONCLUSIONS

Valuation of all agricultural land in North Dakota, based on productivity, increased by 0.81 percent or $4.95 per acre for the 2017 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 Golden Valley County at 5.58 percent. The greatest decrease was in Grand Forks County with a 1.93 percent decrease.

Valuation of cropland in North Dakota increased $6.11 per acre. This was a 0.74 percent increase over 2016. The change in crop revenue and crop mix caused a change in cropland values from negative 2.06 percent to a positive 4.54 percent by county.

Non-cropland values for all counties increased by 1.57 percent 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 2017 analysis was the legislative formula rate of 4.78 percent down from 4.82 in 2016.

The cost of production index increased 10.29 points to 197.18 over the previous year of 186.89. The cost of production index reduced the landowner share of gross returns by 49.28 percent before this value was capitalized.

The analysis for 2017 added data from 2015 and dropped data from 2005. The crop revenue for most counties has been considerably higher since 2007 than prior years. Ten years of data are included in the analysis, however, the high and low years are dropped to calculate an Olympic average. The decline in the capitalization rate resulted in an increase of 0.84 percent in values. This change was more than offset by the increase in the cost of production index. The cost of production index decreased values in all counties by 5.22 percent. This is a net of 4.38 percent decrease from both these factors.

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. Reported market values changed considerably more than productivity values from 2016 to 2017. 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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