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**NORTH DAKOTA LAND VALUATION MODEL**  
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**Abstract**

The North Dakota Land Valuation Model was created by the North Dakota Legislature in the early 1980s. This model is used to estimate the value of agricultural land based on productivity for purposes of real estate tax assessment. Prior to this change, agricultural real estate was assessed based on market values.

This model is used to estimate the average value per acre of cropland and non-cropland, by county, based on the value of crops and livestock produced on these lands. An average value per acre for all agricultural land in each county is calculated by weighting the value of cropland and non-cropland.

This paper describes how the model is constructed, how values are calculated, and what factors impact changes in land values.

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

**NORTH DAKOTA LAND VALUATION MODEL**

From early statehood, property in North Dakota had been assessed for tax purposes at value near market price. However, beginning in the 1940s, the assessed value of land and its market price began to diverge as a result of the depression of the 1930s. During the depression, market prices and assessed values declined sharply. In the 1940s, market prices began to recover, but assessors and equalization boards at all levels of government were reluctant to raise assessed values at the same rate. There was a concern that the rise in market price would be short-lived and declining prices would once again set in.

The difference between market price and assessed value for tax purposes continued to widen until, in the 1970s, assessed value was about 6 percent of market price for agricultural lands, 9 percent for residential properties, 12 percent for commercial properties, and more than 20 percent for centrally assessed properties (such as railroads and utilities). The railroads brought a lawsuit against the state in the late 1970s because of this discrepancy. The North Dakota Supreme Court ruled for the railroads and ordered the state to tax all properties of the same class in a like manner. This ruling resulted in the state's establishing four classes of property for tax purposes: agricultural, commercial, residential, and centrally assessed properties.

Commercial, residential, and centrally assessed properties are assessed on market price while

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agricultural land, since 1981, is assessed based on the value of the crops and livestock produced. State statute (N.D.C.C. §57-02-27.2) mandates that the Department Agribusiness and Applied Economics at NDSU annually compute an estimate of 1) the average value per acre of agricultural lands on a statewide and countywide basis, and 2) the average agricultural value per acre for cropland and non-cropland (defined as agricultural land that is not used as cropland). These estimates must be received by the State Tax Department by December 1 of each year. This paper provides an overview of how the model operates and discusses several related issues.

## **Overview of the Model**

The model calculates agricultural land value 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 assumption is that the remainder of the revenue from the land is used to pay operating expenses and provide a return for the farm operator's labor, management and risk.

The Legislature specified that the landowner share of gross returns is 30 percent of gross returns for cropland except for sugar beets and potatoes which are 20 percent. For non-cropland, 25 percent of gross returns is the landowner's share. Gross returns from irrigated cropland is reduced to 50 percent before applying the 20 or 30 percent factor to determine landowner share.

*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 rate of interest for North Dakota be used as the basis for computing the capitalization rate. The 2003 Legislature amended this provision to place a minimum value for the capitalization rate. Beginning with the 2003 assessment, the capitalization rate is the higher of the average of the latest 12 years' interest rates from AgriBank, FCB after dropping the high and low rates; or 9.5 percent.

Capitalizing the income generated by an asset (that is, dividing the annual income by the capitalization rate) is a well-recognized procedure for estimating the value of an asset.

## **Results from the Model**

The North Dakota Land Valuation model estimates an average value for cropland and non-cropland in each county. An average value of all agricultural land is computed by weighting the cropland and non-cropland values by the number of acres in each category. Appendix A lists the capitalized average annual values per acre by county for cropland, non-cropland and all agricultural land for the 2003 tax year. For example, cropland values ranged from \$186.34 for

Billings County to \$601.12 for Pembina County. Non-cropland values ranged from \$59.38 in Golden Valley County to \$104.61 in Pembina County. All agricultural land values ranged from \$97.47 in Sioux County to \$537.21 in Pembina County. State averages were \$327.13 for cropland, \$77.63 for non-cropland and \$249.94 for all agricultural land.

Local assessment officials use the average values for each class of land as a benchmark when assessing individual tracts of land in their assessment district. Theoretically, any tract of land that has less than average productive potential for the county, based on soil type, is assessed at less than the average value for the county. Likewise, land with productive potential above the county average would be assessed at a value higher than the county average value.

### **Method of Calculation**

The following discussion provides a more detailed description of the calculations in the model. Adams County is used for this illustration (Appendix B).

Available data from the ten most recent years are used in the calculations. The analysis for 2003 used data from 1992 to 2001. Section A of Appendix B (Annual Number of Acres) reports the number of acres in each category for each year. For example:

- In 2001, the National Agricultural Statistics Service (NASS) reported no acres of sugar beets or potatoes in Adams County.
- 281,000 acres were planted in Adams County in 2001 to other crops that NASS reports. This also includes fallow acres. Detailed acreage information for 2001 is shown in Appendix C. The total cropland acreage reported by NASS varies from year to year as a result of planting rotations and changes in the number of acres used to produce crop that NASS reports. Acreage planted to crops not reported by NASS is not included in this number.
- Adams County also had 93,903 acres of CRP in 2001, as reported by the state office of the Farm Service Agency (FSA).
- Total reported cropland acres for Adams County in 2001 was 374,903 acres.
- Non-cropland acreage was 237,950, as reported by the Natural Resources and Conservation Service. The non-cropland consists of 224,750 acres of rangeland and 13,200 acres of pasture (Appendix D). These subcategories are used to reflect the difference in productivity between rangeland and pasture.
- Total agricultural land reported for Adams County was 612,853 acres in 2001.

Section B of the table (Appendix B) is the Annual Gross Returns. Revenue from production on cropland was \$20,642,834 in 2001 (column 4). This is the total revenue for the crops produced in Adams County as reported by NASS. The data for calculating total revenue are shown in

Appendix C. These include acres harvested, yield per harvested acre, and price for each commodity. Price for the commodity is either 1) the crop reporting district price reported by NASS or 2) the state price reported by NASS (if a crop reporting district price is not available). Only one-half of the revenue from irrigated crops is included as revenue in recognition of the additional cost of irrigating (as required by law). Revenue from crops not reported by NASS is not included in this calculation. Likewise, acreage of all crops does not include acres devoted to crops on which NASS does not report county data.

Column 5 in the Annual Gross Returns section of Appendix B lists government payments at \$6,046,447 in 2001 for Adams County. This number was obtained from FSA.

CRP payments are not included in government payments reported in column 5. They are reported separately in column 6. Appendix B shows \$840,106 for Adams County in 2001 which is one-half of the amount actually received as reported by FSA. The assumption is that the other one-half of the payment is for establishing and maintaining the CRP grass cover and is not revenue received by the landowner.

The sum of revenue from crops, government program payments and CRP was \$27,529,387 (column 7). This was the gross revenue from all reported cropland acres in Adams County for 2001.

Gross revenue from non-cropland is shown in column 8 (Appendix B). In 2001, Adams County's non-cropland revenue was \$7,967,746 and is based on the carrying capacity of non-cropland in the county and the value of beef produced on those acres. The carrying capacity of rangeland is 0.55 animal unit month (AUM) per acre and 0.60 AUM per acre for pasture (Appendix D). These values were estimated by scientists with the NDSU Animal and Range Science Department at the time this model was implemented.

Revenue from non-cropland is estimated by calculating the value of beef produced per month of grazing. Basic assumptions are that:

- the grazing season is six months,
- calf production during the grazing period is 316.5 pounds per cow, and
- one-sixth of the cow herd is culled each year, resulting in 150 pounds of cull beef cow sales per cow in the herd.

These weight are divided by six to determine the amount of production per month. This yields 52.75 pounds of calf weight and 25 pounds of cull cow weight per AUM of carrying capacity from the county's non-cropland.

Livestock prices for 2001 were \$95.50 per cwt. for calves and \$40.80 per cwt. for cull cows (as reported by NASS). Thus, the value per AUM is \$60.576 ((52.75 lbs. x \$0.955) + (25 lbs. x \$0.408)). Revenue from rangeland, as shown in Appendix D, was \$7,487,982 (224,750 acres x

0.55 AUM x \$60.576). Revenue from pasture was \$479,764 (13,200 acres x 0.60 AUM x \$60.576). Total revenue for non-cropland for 2001 was \$7,967,746.

Total annual gross revenue from all agricultural land in Adams County for 2001 was \$35,497,133 (column 9, Section B, Appendix B).

Section C lists the landowner share of returns, that is, the percent of each category of income that is designated as the landowner share. As specified in the statute, the landowner share of revenue from sugar beets and potatoes is 20 percent, 30 percent for all other crops, and 25 percent of non-cropland revenue.

The landowner share of revenue from cropland for 2001 was \$8,846,890 (column 7), as shown in Section D (Annual landowner share of gross returns). The landowner share for non-cropland was \$1,991,937 (column 8); and for all agricultural land, the landowner share was \$10,838,827 (column 9).

In computing averages, the most recent ten years of data are used, with the high and low years dropped, as specified in state law. The next line (Section E) lists which eight years are used for each land category in developing this year's report. Averages for cropland for Adams County were computed after dropping the data for 1996, the high year and 1999, the low year. The averages for non-cropland were computed after dropping the data for 2000, the high year and 1996, the low year.

The eight-year average acres for each category of land are listed in Section F. They are 391,068 acres of cropland, 237,950 acres of non-cropland, and 629,018 total acres.

Section G shows the eight-year average annual landowner share of gross returns. They are \$8,601,044 for cropland, \$1,798,687 for non-cropland, and \$10,838,827 for all agricultural land in Adams County.

The averages calculated in Section G are then adjusted by the cost of production index (explained on page 9). The cost of production index and the adjusted averages are shown in Section H. They are \$7,833,373 for cropland, \$1,638,149 for non-cropland, and \$9,471,522 for all agricultural land.

The landowner share of gross return is divided by the number of acres to calculate the landowner share of gross return per acre (Section I). For the 2003 assessment, this value was \$20.03 ( $\$7,833,373 / 391,068$ ) per acre for cropland, \$6.88 ( $\$1,638,149 / 237,950$ ) per acre for non-cropland, and \$15.06 ( $\$9,471,522 / 629,018$ ) per acre for all agricultural land in Adams County.

The landowner share of gross returns per acre for cropland and non-cropland was divided by the capitalization rate of 9.50 percent to estimate the average value per acre (Section J). The calculated value for the capitalization rate according to the formula resulted in a rate of 8.54 percent. Therefore the minimum capitalization rate of 9.50 percent was used.

For the 2003 assessment, the calculated average value for cropland in Adams County was \$210.85 per acre and non-cropland was \$72.47 per acre. Also included in this section is a value for inundated land. This value was \$7.25 per acre. The inundated land category was added to the model by the 1999 Legislature. The value for inundated land was set by the statute at 10 percent of the value of non-cropland. Landowners are required to apply annually to have land classified as inundated. These requests are approved by the County Commissioners.

The line labeled “Acreage provided or reviewed by county” (Section K), is the number of acres the county director of tax equalization reported for cropland, non-cropland and inundated land. The acreage of each category is multiplied by its value from Section J to calculate the total value of each category in the county. The values of all three categories are summed and divided by the total acreage of all agricultural land to determine the capitalized average value for all agricultural land in the county. For the 2003 assessment, the average all land value for Adams County was \$158.47 per acre (Section L).

This last step is significant if the proportion of cropland to non-cropland in a county is different from what has been used in the preceding computations. The landowner share of gross returns per acre (the value that is capitalized) is computed from production of individual crops reported by NASS. Some cropland in every county is used to produce minor crops for which NASS does not keep county specific data. Therefore the eight-year average acres (Section F) understates the total acres of cropland. For non-cropland, the proportion of pasture and rangeland was obtained from the Natural Resources and Conservation Service (NRCS). However the sum of pasture and rangeland acres provided by NRCS is generally different from what the county lists on its tax rolls. Finally, the acreage of inundated land must be provided by the county as no other source is available. The average value per acre of all agricultural land in a county is a weighted average of all categories. Therefore if the acreage in any category is incorrect the average value will be skewed.

### **How the Values Are Used**

The results of the analysis are provided to the North Dakota State Tax Department by December 1 of each year. The Tax Department provides these estimates of agricultural land value for each county to each county director of tax equalization by January 1 of each year.

Prior to February first of each year the county director of tax equalization in each county provides to all assessors within the county an estimate of the average agricultural value of agricultural lands within each assessment district. These estimates are based on the average agricultural value for the county adjusted by the relative value of lands within each assessment district compared to the county average. In determining the relative value of lands for each assessment district compared to the county average, the county director of tax equalization shall, wherever possible, use soil type and soil classification data from detailed and general soil surveys.

The values calculated in this model are not used directly to value any individual tract of land, but rather as a benchmark for total valuation of agricultural land in a county. It is the duty of each

local assessor to determine the relative value of each assessment parcel within his/her jurisdiction and to determine the agricultural value of each assessment parcel by adjusting the agricultural value estimate for the assessment district by the relative value of each parcel.

Total assessed value for all agricultural land within a county is certified by the State Board of Tax Equalization. Counties are required to assess a total value for agricultural land within 5 percent of the average per acre value for all agricultural land in the county multiplied by the total acres of taxable agricultural land in the county. If the total assessed value falls outside this range, the State Board of Equalization will require the county to make adjustments to meet this requirement. It is the local governments' responsibility to determine the mill levy and tax; the model does not address those issues.

### **Why the Model Was Developed**

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

### **What Causes the Values to Change**

The three major factors influencing land values in the model are the gross return the land generates, the cost of production index and the capitalization rate.

*Gross Returns* – The land valuation model was designed to reflect current production and prices, therefore, the revenue being generated by the land. However, both yields and prices of agricultural commodities vary considerably from year to year. In order to assure some stability to the results of the model, the designers incorporated multi-year averages in computing the gross returns. Originally the model used the six most recent years of production data; the high and low years were dropped and the remaining four years were averaged. Even with this multi-year average, any one year had a 25 percent influence in computing the average. As the data from the 1988 and 1989 drought years rolled out of the six-year data set, the average gross returns increased substantially causing significant increases in calculated land values. This resulted in the 1997 Legislature amending the statute from using six years of data to using ten years of data. The change from six to ten years was phased in by adding one year to the data set each year for four years. The analysis for the 2000 assessment was the first one utilizing ten years of data.

The high and low years are dropped and the remaining eight years of data are averaged. The impact of each year in computing the average is halved from when the model utilized six years



of production data. The result has been more stability in the calculated land values. This is especially apparent with non-cropland. For non-cropland, production from year to year does not change. Prices of calves and cull cows are the major causes of change from year to year. Cattle prices tend to follow approximately a ten-year cycle. As a result, the model contains most of the years in a typical cattle cycle resulting in a stable landowner share of gross returns.

Averaging ten years of data results in more stability in land values which was the objective of expanding the data set from six to ten years. However, this does not eliminate the possibility of a substantial change from one year to the next as crop yields tend to be random events. Table 1 illustrates which years' gross return data were used to calculate the value of cropland in Sargent County for 2002 and 2003. For 2002, the data from 1991 to 2000 were used. The low year (1993), and the high year (2000), were dropped and the remaining eight years averaged. For 2003, the data from 1991 was eliminated and data from 2001 was added. The data from 1993 and 2000 are still the high and low and consequently dropped before calculating an average. This example shows a significant increase in the average landowner share of gross returns because the returns for the new year added to the data set was nearly 50 percent greater than for the year that was eliminated from the data set.

Table 1. Annual landowner share of gross returns from cropland, Sargent County

<u>Year</u>	<u>Landowner Share of Gross Returns</u>	<u>Used for 2002</u>	<u>Used for 2003</u>
	\$	\$	\$
1991	14,922,993	used	n/a
1992	15,968,975	used	used
1993	11,941,052	low year	low year
1994	16,959,974	used	used
1995	17,042,779	used	used
1996	21,826,133	used	used
1997	19,962,136	used	used
1998	17,750,621	used	used
1999	18,737,306	used	used
2000	22,506,653	high year	high year
2001	21,642,000	n/a	used
<u>Average (8-yr)</u>		17,896,365	18,736,241

County specific production and price data from NASS is published in their annual report which is not available until June of the following year. Consequently, information for the calendar year in which the analysis is completed is not yet available to be used in calculating the estimated land values. For example, the county average land values for the 2003 assessment were completed in November of 2002, but production and price data for the 2002 calendar year were not available at that time. Therefore, the ten years of data included the span of 1992 through 2001. The result is a time lag in the data used to estimate the land values.

The combination of the time lag, discarding the high and low years, and using an eight-year average can lead to some unexpected results. For example, several counties in the southern half of North Dakota experienced the driest and least productive year in 2002 since the drought years of 1988-89. Yet for some counties, the average annual landowner share of gross returns increased. An example is Emmons County. Table 2 lists the landowner share of gross returns from cropland for 1991 through 2001 for Emmons County, and the eight-year average revenue used to compute the cropland values for 2002 and 2003. Even though 2002 may have been a very low production year (the data are not shown in this table because they were unavailable at the time the 2003 report was prepared), it does not impact the 2003 land values. Furthermore, once the data are available, they may be discarded by the model if it is the low year. This situation illustrates that the most recent year is not an accurate indicator of the values that will be calculated by the model.

Table 2. Landowner share of gross returns from cropland, Emmons County

<u>Year</u> Date of Report	<u>Revenue</u> \$	<u>2002</u> (Dec 2001) \$	<u>2003</u> (Dec 2002) \$
1991	11,135,871	low	n/a
1992	13,161,550	13,161,550	13,161,550
1993	14,509,450	14,509,450	14,509,450
1994	13,933,542	13,933,542	13,933,542
1995	13,853,906	13,853,906	13,853,906
1996	16,327,685	16,327,685	16,327,685
1997	12,979,537	12,979,537	low
1998	15,803,674	15,803,674	15,803,674
1999	13,658,233	13,658,233	13,658,233
2000	19,322,849	high	19,322,849
2001	19,889,676	n/a	high
<u>Average (8-year)</u>		14,278,447	15,071,361

*Cost of Production Index* – When the land valuation model was developed in the early 1980s, the Legislature determined the landowner share of gross returns would be 30 percent for all crops except sugar beets and potatoes, which were set at 20 percent. The typical share rent arrangement at that time was one-third of the crop to the landowner and two-thirds to the operator. One third of the crop was the landowners gross revenue from which real estate taxes and marketing costs for the landowners share must be paid. Therefore, the Legislature decided that 30 percent represented a typical net return to the landowner.

Since the development of the land value model, the variable costs of production have increased significantly, such that in recent years share rents as well cash rents represented less than one-third share of the crop. Yet the model was inflexible in that concern. To address this situation, the 1999 Legislature added a cost of production index to account for the changing proportion of the land's contribution to the production of commodities. The landowner share of gross returns is divided by the cost of production index. This reduces the return per acre which is the amount that is capitalized. Thus, calculated land values are lower than they otherwise would be if the cost of production index were not a part of the model. The cost of production index reduced the eight-year average landowner share of gross returns per acre 8.93 percent before being capitalized. The cost of production index used in this model is the index for "Items Used for Production, Interest, Taxes and Wage Rates (PITW)". This index is published in the *Prices Paid Index* from NASS. The cost of production index used in the model is an average of the latest ten years indices after dropping the high and low values divided by the base index of 102. The base index was created from an Olympic average of the indices from 1989 to 1995. The cost of production indices used in the model since 1999 are shown in table 3.

Table 3. Cost of production indices

<u>Assessment Year</u>	<u>Index</u>
1999	102.5
2000	103.9
2001	105.2
2002	107.2
2003	109.8

*Capitalization Rate* – The eight-year average of the landowner share of gross returns is divided by the capitalization rate to estimate the value per acre. Therefore, year-to-year fluctuations in the capitalization rate can result in substantial changes in the calculated land value. An average of the last 12 years (after dropping the high and low years) is used to reduce the variability resulting from fluctuating interest rate. Using a multi-year average reduces variability, yet allows the model to reflect a changing environment.

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 2003 Legislature amended the statute that defines the capitalization rate to be used in the model. This legislative change placed a minimum of 9.5 for the capitalization rate if the calculated value falls below this level. There is no maximum level for the capitalization rate.

The annual average rate of interest on mortgage loans made in North Dakota is used to develop the capitalization rate. Although the annual interest rate fluctuated throughout the 1980s, the capitalization rate increased steadily from 1983 through 1993, and has been declining since 1994 (Table 4). The following example demonstrates the impact a fluctuating capitalization rate has

on land values even though the landowner share of gross returns is constant. Assuming a constant landowner share of gross returns of \$31 per acre for cropland and \$10 per acre for non-cropland, Table 4 shows the calculated land values for each year.

In this example (Table 4), cropland value declines by \$141.40 per acre from 1983 to 1993, then rises \$75.99 per acre through 2002. Non-cropland value declines by \$45.61 and recovers by \$24.51 during the same period. For 2003 and 2004, the calculated capitalization rate falls below the minimum and is replaced by 9.5 percent. As the interest rate declined over the past several years (especially since 1990), the capitalization rate decreased (but more slowly), resulting in higher land values.

Table 4. Annual interest rate, capitalization rate, and calculated land value by year assuming a constant landowner share of gross return of \$31 from cropland and \$10 from non-cropland, 1980-2004

<u>Year</u>	<u>Annual Rate</u> %	<u>Capitalization Rate</u> %	<u>Cropland Value</u> \$/ac	<u>Non-cropland Value</u> \$/ac
1980	10.17	---	---	---
1981	11.08	7.50	413.33	133.33
1982	12.50	7.50	413.33	133.33
1983	11.50	7.50	413.33	133.33
1984	11.63	7.80	397.44	128.21
1985	12.44	9.11	340.29	109.77
1986	12.01	9.56	324.27	104.60
1987	10.85	9.93	312.19	100.70
1988	10.95	10.31	300.68	96.99
1989	11.58	10.54	294.12	94.88
1990	11.25	10.79	287.30	92.68
1991	10.69	11.12	278.78	89.93
1992	8.19	11.35	273.13	88.11
1993	7.38	11.40	271.93	87.72
1994	8.98	11.40	271.93	87.72
1995	8.55	11.11	279.03	90.01
1996	8.36	10.76	288.10	92.94
1997	8.27	10.47	296.08	95.51
1998	8.43	10.14	305.72	98.62
1999	8.10	9.77	317.30	102.35
2000	8.32	9.45	328.04	105.82
2001	6.48	9.18	337.69	108.93
2002	5.25	8.91	347.92	112.23
2003	n/a	8.53*	363.42	117.23
2004		8.11*	382.24	123.30

\*The capitalization rates for 2003 and 2004 fall below the minimum legislated level and are replaced with 9.5 percent.

The change in land values may be minimal for years when gross returns and the capitalization rate move in the same direction. However, during times when these two factors move in opposite directions, the impact on land value from one year to the next can be substantial. As an example, if an average annual return per acre of \$30 is capitalized by 10 percent, the land value would be \$300 per acre. If both the return and the capitalization rate increase by 5 percent, the land value does not change. However, if the annual return increases by 5 percent and the capitalization rate decreases by 5 percent, the land value increases by 10.5 percent.

Likewise, the change in land value could be substantial if the gross return or interest rate of the most recent year added to the data set differs considerably from the values for the year that drops out of the data set.

## **Issues**

Adding the cost of production index to the model may be a concern at some time in the future. Historically, the cost of production index has increased 2.5 to 3.0 percent per year while commodity prices have been relatively flat. Productivity has been increasing but at a slower rate than the increase in the cost of production index. Without a similar factor applied to the assessed value for the other classes of property, it is likely that there will be a shift in value of assessed property from agriculture to the other classes.

The impact of changing the model to lower estimated land values does not reduce the amount of revenue local governments need. Instead, it may lead to a change in the local levy. Changes in estimated land values can, however, shift the tax burden among property categories if changes in the value of property among categories are not in equal proportions.

## **Summary**

The tax model estimates a value for North Dakota's agricultural lands by capitalizing the landowner's share of the revenue generated from the land. These computations rely on numerous data sources and assumptions (some of which have been specified by the Legislature). The model will continue to be adjusted to reflect new legislation, concerns of local tax officials, changes in data sources, and trends in the agricultural industry.

Land values based on capitalizing average annual landowner share of gross returns replaces market value for the purpose of assessing value to agricultural land. A common criticism of using market value is that agricultural land values often have a speculative value above the value based on its current ability to generate revenue. This is a major concern for land surrounding growing communities where there is demand for development purposes and in areas where considerable hunting pressure inflates market values.

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### **Contact Information**

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## Appendix A

North Dakota Capitalized Average Annual Values Per Acre by County for 2003 Assessment

County	Cropland	Noncropland	All Agricultural Land
Adams	210.85	72.47	158.47
Barnes	404.91	100.68	349.03
Benson	295.06	89.14	250.75
Billings	186.34	67.84	104.47
Bottineau	301.25	86.26	264.93
Bowman	207.73	59.86	133.54
Burke	248.23	79.32	197.16
Burleigh	241.15	79.56	168.19
Cass	508.35	102.36	497.05
Cavalier	369.28	87.48	329.21
Dickey	396.76	100.43	302.59
Divide	237.10	78.87	195.33
Dunn	210.44	72.28	124.64
Eddy	271.04	89.51	216.74
Emmons	278.63	78.80	193.47
Foster	337.94	86.16	291.88
Golden Valley	221.18	59.38	137.75
Grand Forks	479.90	100.48	447.58
Grant	212.33	72.65	134.35
Griggs	347.08	87.80	288.78
Hettinger	261.13	72.10	214.12
Kidder	236.41	80.35	165.78
LaMoure	395.27	103.86	356.90
Logan	262.52	79.29	174.05
McHenry	248.29	85.69	198.74
McIntosh	247.89	78.84	180.48
McKenzie	246.14	72.58	142.25
McLean	287.19	79.05	251.09
Mercer	235.32	72.25	164.71
Morton	248.50	72.42	145.86
Mountrail	260.82	78.76	184.77
Nelson	307.44	87.33	269.78
Oliver	276.55	72.63	156.30
Pembina	601.12	104.61	537.21
Pierce	264.49	85.70	226.52
Ramsey	307.05	89.79	267.55
Ransom	435.70	98.92	359.75
Renville	316.97	85.95	299.17
Richland	570.25	101.64	502.38
Rolette	279.82	87.18	246.91
Sargent	465.57	101.44	401.97
Sheridan	256.70	78.83	187.44
Sioux	200.72	72.48	97.47
Slope	230.32	66.04	160.26
Stark	238.54	72.80	177.01
Steele	437.45	89.21	389.40
Stutsman	319.13	99.22	249.66
Towner	302.90	89.54	293.39
Traill	549.63	101.44	515.26
Walsh	551.21	93.61	502.62
Ward	312.88	78.75	258.10
Wells	319.85	86.49	278.04
Williams	216.05	78.98	164.98
State	327.13	77.63	249.94

1	2	3	4	5	6	7	8	9
Adams County	Calculations for 2003 assessments							
A Annual number of acres:	Year	<u>Sugarbeets &amp; Potatoes</u>	<u>NASS Cropland</u>	<u>Govt Payments</u>	<u>CRP</u>	<u>Reported Cropland</u>	<u>Reported Non-cropland</u>	<u>Reported Total</u>
	1992		322,600		83,438	406,038	237,950	643,988
	1993		317,200		84,130	401,330	237,950	639,280
	1994		312,700		84,130	396,830	237,950	634,780
	1995		298,400		84,130	382,530	237,950	620,480
	1996		329,400		84,130	413,530	237,950	651,480
	1997		323,100		93,903	417,003	237,950	654,953
	1998		287,200		93,903	381,103	237,950	619,053
	1999		283,600		93,903	377,503	237,950	615,453
	2000		274,900		93,903	368,803	237,950	606,753
	2001		281,000		93,903	374,903	237,950	612,853
B Annual gross returns:	1992	0	20,946,341	2,328,513	1,407,888	24,682,742	7,760,418	32,443,160
50% of return on irrigated cropland is included in NASS cropland gross returns; CRP returns are 50% of payments reported by FSA	1993	0	23,437,827	3,266,417	1,418,695	28,122,939	8,269,514	36,392,453
	1994	0	15,950,705	2,470,852	1,418,695	19,840,252	7,346,617	27,186,869
	1995	0	22,138,041	921,785	1,418,695	24,478,521	5,988,412	30,466,933
	1996	0	27,072,735	2,705,124	1,418,695	31,196,554	4,766,442	35,962,996
	1997	0	22,986,593	2,097,963	1,298,679	26,383,235	6,386,067	32,769,302
	1998	0	18,198,280	4,236,505	1,298,680	23,733,465	6,572,318	30,305,783
	1999	0	13,764,761	4,756,907	1,202,552	19,724,220	7,266,907	26,991,127
	2000	0	18,998,384	11,020,264	1,000,589	31,019,237	8,313,183	39,332,420
	2001	0	20,642,834	6,046,447	840,106	27,529,387	7,967,746	35,497,133
C Landowner share of returns		20.00%	30.00%	30.00%		30.00%	25.00%	28.88%
D Annual landowner share of gross returns	1992					8,390,344	1,940,105	10,330,448
	1993					9,429,968	2,067,379	11,497,347
	1994					6,945,162	1,836,654	8,781,816
	1995					8,336,643	1,497,103	9,833,746
	1996					10,352,053	1,191,611	11,543,663
	1997					8,824,045	1,596,517	10,420,562
	1998					8,029,116	1,643,080	9,672,195
	1999					6,759,052	1,816,727	8,575,779
	2000					10,006,183	2,078,296	12,084,479
	2001					8,846,890	1,991,937	10,838,827
E These 8 years of data were used in the following calculations:					1994,1998,1995,1992, 1997,2001,1993,2000		1995,1997,1998,1999, 1994,1992,2001,1993	
F Eight-year annual average acres:						391,068	237,950	629,018
G Eight-year average annual landowner share of gross returns:						8,601,044	1,798,687	10,399,731
H Adjusted for cost of production index @		109.8				7,833,373	1,638,149	9,471,522
I Eight-year average landowner share of gross returns per acre:							20.03	6.88
J Capitalized average annual value per acre @		9.50%			Inundated 7.25	210.85	72.47	15.06
K Acreage provided or reviewed by county: Inundated acres						377,039	229,671	606,710
L Capitalized average value based on acreage provided or reviewed by county:								158.47

**Year: 2001**

**County: Adams**

<u>Crop</u>	<u>Acres Planted</u>	<u>Acres Harvested</u>	<u>Yield/Acre Harvested</u>	<u>Production</u>	<u>Price</u>	<u>Total Revenue</u>
Spring wheat	128,000	120,000	31.50	3,780,000	2.79	10,546,200.00
Durum	18,500	18,000	29.60	533,000	4.03	2,147,990.00
Barley	9,000	8,100	58.80	476,000	1.41	671,160.00
Oats	9,800	4,000	50.00	200,000	1.24	248,000.00
Rye	0	0	0.00	0	1.55	0.00
Sunflower oil	13,500	13,300	1275.00	16,960,000	0.09	1,592,544.00
Sunflower non oil	0	0	0.00	0	0.12	0.00
Flaxseed	1,400	1,400	17.40	24,400	4.29	104,676.00
Corn grain	8,500	4,300	60.00	258,100	1.87	482,647.00
Corn silage	0	4,000	9.10	36,400	16.67	606,666.67
Alfalfa hay	45,000	45,000	1.38	62,000	50.00	3,100,000.00
Other hay	22,000	22,000	1.20	26,500	35.50	940,750.00
Soybeans	0	0	0.00	0	4.05	0.00
Sugar beets	0	0	0.00	0	43.64	0.00
Potatoes	0	0	0.00	0	6.00	0.00
Durum irrigated	0	0	0.00	0	4.03	0.00
Spring wheat irrigated	0	0	0.00	0	2.79	0.00
Barley irrigated	0	0	0.00	0	1.41	0.00
Winter wheat	1,700	800	30.00	24,000	2.39	57,360.00
Dry edible beans	600	400	1775.00	7,100	20.40	144,840.00
Corn grain irrigated	0	0	0.00	0	1.87	0.00
Corn silage irrigated	0	0	0.00	0	16.67	0.00
Potatoes irrigated	0	0	0.00	0	6.00	0.00
Summerfallow	<u>23,000</u>					
TOTAL	281,000					<u>20,642,833.67</u>

Appendix C



### Appendix D

Year: 2001      Calf Price (\$/cwt) 95.50      Cow Price (\$/cwt) 40.80

County	Range Acres	Pasture Acres	Total Acres	Range AUM	Pasture AUM	Range Revenue	Pasture Revenue	Total Revenue
Adams	224,750	13,200	237,950	0.55	0.60	7,487,982	479,764	7,967,746
Barnes	43,400	24,300	67,700	0.75	0.80	1,971,757	1,177,602	3,149,359
Benson	47,000	70,000	117,000	0.65	0.70	1,850,604	2,968,236	4,818,840
Billings	215,000	3,420	218,420	0.55	0.60	6,729,055	117,397	6,846,452
Bottineau	50,800	9,640	60,440	0.65	0.70	2,000,228	408,769	2,408,997
Bowman	306,000	46,800	352,800	0.45	0.50	8,341,350	1,417,484	9,758,834
Burke	131,600	14,700	146,300	0.60	0.65	4,783,101	578,806	5,361,907
Burleigh	353,600	56,700	410,300	0.60	0.65	12,851,857	2,232,538	15,084,395
Cass	11,200	18,000	29,200	0.75	0.80	508,841	872,298	1,381,139
Cavalier	33,700	17,800	51,500	0.65	0.70	1,326,923	754,780	2,081,703
Dickey	82,100	38,900	121,000	0.75	0.80	3,729,983	1,885,133	5,615,116
Divide	172,300	5,600	177,900	0.60	0.65	6,262,373	220,498	6,482,871
Dunn	714,600	19,900	734,500	0.55	0.60	23,808,284	723,280	24,531,564
Eddy	23,200	44,200	67,400	0.65	0.70	913,490	1,874,229	2,787,719
Emmons	308,300	6,600	314,900	0.60	0.65	11,205,395	259,872	11,465,267
Foster	42,800	7,250	50,050	0.65	0.70	1,685,231	307,424	1,992,655
Golden Valley	282,900	17,800	300,700	0.45	0.50	7,711,660	539,129	8,250,789
Grand Forks	39,600	19,400	59,000	0.75	0.80	1,799,115	940,143	2,739,258
Grant	504,600	46,300	550,900	0.55	0.60	16,811,727	1,682,808	18,494,535
Griggs	28,300	18,500	46,800	0.65	0.70	1,114,300	784,462	1,898,762
Hettinger	102,500	0	102,500	0.55	0.60	3,414,986	0	3,414,986
Kidder	265,600	92,640	358,240	0.60	0.65	9,653,431	3,647,659	13,301,090
LaMoure	5,250	28,640	33,890	0.75	0.80	238,519	1,387,923	1,626,442
Logan	216,600	23,000	239,600	0.60	0.65	7,872,489	905,615	8,778,104
McHenry	348,800	27,300	376,100	0.65	0.70	13,733,847	1,157,612	14,891,459
McIntosh	162,500	4,650	167,150	0.60	0.65	5,906,184	183,092	6,089,276
McKenzie	595,200	46,800	642,000	0.55	0.60	19,830,241	1,700,981	21,531,222
McLean	296,226	19,000	315,226	0.60	0.65	10,766,556	748,117	11,514,673
Mercer	295,686	6,580	302,266	0.55	0.60	9,851,352	239,155	10,090,507
Morton	561,130	28,300	589,430	0.55	0.60	18,695,133	1,028,585	19,723,718
Mountrail	522,200	7,900	530,100	0.60	0.65	18,979,751	311,059	19,290,810
Nelson	50,700	24,100	74,800	0.65	0.70	1,996,290	1,021,921	3,018,211
Oliver	194,100	17,000	211,100	0.55	0.60	6,466,818	617,878	7,084,696
Pembina	960	22,500	23,460	0.75	0.80	43,615	1,090,373	1,133,988
Pierce	118,600	9,600	128,200	0.65	0.70	4,669,823	407,072	5,076,895
Ramsey	12,100	28,000	40,100	0.65	0.70	476,432	1,187,295	1,663,727
Ransom	40,500	4,050	44,550	0.75	0.80	1,840,004	196,267	2,036,271
Renville	41,200	5,250	46,450	0.65	0.70	1,622,232	222,618	1,844,850
Richland	55,000	56,200	111,200	0.75	0.80	2,498,770	2,723,508	5,222,278
Rolette	51,700	22,200	73,900	0.65	0.70	2,035,665	941,355	2,977,020
Sargent	41,500	37,600	79,100	0.75	0.80	1,885,436	1,822,134	3,707,570
Sheridan	214,000	5,700	219,700	0.60	0.65	7,777,991	224,435	8,002,426
Sioux	475,000	28,850	503,850	0.55	0.60	15,825,545	1,048,575	16,874,120
Slope	261,000	21,300	282,300	0.55	0.60	7,905,201	709,651	8,614,852
Stark	242,200	28,720	270,920	0.55	0.60	8,069,362	1,043,850	9,113,212
Steele	11,300	17,720	29,020	0.65	0.70	444,933	751,388	1,196,321
Stutsman	275,000	43,300	318,300	0.75	0.80	12,493,852	2,098,361	14,592,213
Towner	7,300	14,200	21,500	0.65	0.70	287,434	602,128	889,562
Traill	15,900	14,400	30,300	0.75	0.80	722,372	697,838	1,420,210
Walsh	22,000	8,600	30,600	0.65	0.70	932,874	390,717	1,323,591
Ward	251,400	3,665	255,065	0.60	0.65	9,137,322	144,308	9,281,630
Wells	56,400	13,600	70,000	0.65	0.70	2,220,725	576,686	2,797,411
Williams	375,000	19,000	394,000	0.60	0.65	13,629,656	748,117	14,377,773
State	9,800,302	1,229,375	11,029,677			344,818,097	50,800,925	395,619,022

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