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Dwight G. Aakre, David M. Saxowsky, and Harvey G. Vreugdenhil

Department of Agricultural Economics
Agricultural Experiment Station
North Dakota State University
Fargo, ND

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Department of Agricultural Economics
North Dakota State University
Fargo, ND 58105-5636

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Abstract

North Dakota agricultural land is valued for property tax purposes as the capitalized value of the landowner's share of gross revenue. This paper describes the data sources, assumptions, and current issues relative to operating the model.

Key words: agricultural land, cropland, tax, assessed value, valuation, capitalization, land value

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Dwight G. Aakre, David M. Saxowsky, and Harvey G. Vreugdenhil*

From early statehood days, property in North Dakota has been assessed for tax purposes at values 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 value for tax purposes continued to widen until, in the 1970s, value for tax purposes 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 agricultural land, since 1981, is valued based on crop and livestock production. State statute (N.D.C.C. §57-02-27.2) mandates that the Department of Agricultural 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 being 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 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 the 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 management and risk.

> The Legislature has specified that the landowner share of gross returns is 30 percent of gross returns, except for non-cropland (25 percent), sugar beets and potatoes (20 percent), and irrigated land (50 percent of the dry land rate).

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 has specified that the gross federal land bank (AgriBank, FCB) mortgage rate of interest for North Dakota be used as the basis for computing the capitalization rate.

Capitalizing the income generated by an asset (that is, dividing the annual income by the

*Farm Management Specialist, Associate Professor, and Experiment Station Specialist, respectively, in the Department of Agricultural Economics, North Dakota State University, Fargo.

capitalization rate) is a well-recognized procedure for estimating the value of the asset.

Results from the Model

The North Dakota Agricultural Land Value model estimates an average value for cropland and non-cropland in each county. An average value of all agricultural land then is computed by weighting the average of the two categories by the acreage 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 1997 tax year. For example, cropland values ranged from $156.85 for Billings County to $514.48 for Pembina County; non-cropland values ranged from $65.10 in Golden Valley County to $114.69 in Pembina County; and the average value for all agricultural land ranged from $99.85 in Billings County to $464.95 in Pembina County. State average values are $295.12 for cropland, $85.10 for non-cropland, and $236.40 for all agricultural land.

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 six most recent years are used in the calculations; this year's computations are based on data from 1990 to 1995. Section A of Appendix B (Annual Number of Acres) reports the number of acres in each category for each year. For example:

- In 1995, the National Agricultural Statistics Service (NASS) reported no acres of sugar beets or potatoes in Adams County.

- 298,400 acres were planted in Adams County in 1995 to crops that NASS reports (including fallow). Detailed acreage information for 1995 is shown in the first column of Appendix C. The total cropland acreage reported by NASS varies from year to year as a result of planting rotation and changes in the number of acres used to produce crops that NASS reports. Acreage planted to crops not reported by NASS are not included in this number.

- Adams County also had 84,130 acres of CRP in 1995, as reported by the state office for the Farm Service Agency (FSA).

- Total reported cropland acres for Adams County in 1995, therefore, was 382,530 acres.

- Non-cropland acreage was 237,950, as reported by the state office of 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 620,480 acres in 1995.

Section B of the table (Appendix B) is the Annual Gross Returns. Revenue from production on cropland was $21,690,540 in 1995 (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 regional price reported by NASS or 2) the state price reported by NASS (if a regional price is not reported). Only one-half of the revenue from irrigated crops is included as revenue in recognition of the additional cost of irrigating (as required by state law). Revenue from crops not reported by NASS is not included in this calculation.

The column 5 in the Annual Gross Returns section of Appendix B lists government payments at $921,785 in 1995 for Adams County. This number was reported by FSA.

A separate column (6) is used to display CRP payments. Appendix B shows $1,418,695 for Adams County in 1995, which is one-half of the amount 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 is $24,031,020 (column 7). This is the gross income from all reported cropland acres in Adams County in 1995.

Gross income from non-cropland is shown in column 8 (Appendix B). In 1995, Adams County's non-cropland revenue was $5,988,412 and is based on the carrying capacity of non-cropland in the county and the value of beef produced on these acres. The carrying capacity of the rangeland is 0.55 animal unit month (AUM) per acre and 0.60 AUM per acre for pasture (Appendix D), as estimated at the time the model was developed.

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 will be culled resulting in 150 pounds of cull beef cow sold per cow in the herd.

These weights are divided by six to determine the amount of production per month, that is, 52.75 pounds of calf weight and 25 pounds of cull cow weight per AUM.

Livestock prices for 1995 were $69.20 per cwt. for calves and $36.10 per cwt. for cull cows (as reported by NASS). Thus, the value per AUM is $45.528 ((52.75 lbs. x $0.692) + (25 lbs. x $0.361)). Revenue from rangeland, as shown in Appendix D, was $5,627,830 (224,750 acres x 0.55 AUM x $45.528); revenue from pasture was $360,582 (13,200 acres x 0.60 AUM x $45.528); and total revenue for non-cropland was $5,988,412.

Total annual gross returns from agricultural land in Adams County for 1995 was $30,019,432 (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 cropland revenue for 1995 is $8,202,393 (column 7), as shown in Section D (Annual Landowner Share of Gross Returns). The landowner share for non-cropland is $1,497,103 (column 8); and for all agricultural land, the landowner's share is $9,699,496 (column 9).

In computing averages, the most recent six years of data are used with the high and low years dropped, as specified in state law. The next line (Section E) lists which four years are used for each land category in developing this year's report (1990, 1992, 1994, and 1995 for cropland; and 1991, 1992, 1993, and 1994 for non-cropland).

The four-year average acres for each category of land are listed in Section F -- 403,350 acres of cropland, 237,950 acres of non-cropland, and 641,300 total acres.

The four-year average annual landowner share of gross return is $7,395,989 for cropland, $1,978,952 for non-cropland, and $9,374,941 for total revenue (Section G).

The landowner share of gross return is divided by the number of acres to calculate the landowner share of gross returns per acre (Section H). For the 1997 tax year, this value is $18.34 ($7,395,989 / 403,350) per cropland acre, $8.32 ($1,978,952 / 237,950) per non-cropland acre, and $14.62 ($9,374,941 / 641,300) per acre of all agricultural land.

The value for cropland and non-cropland is divided by the capitalization rate of 10.47 percent to estimate an average value of $175.17 per acre for cropland and $79.45 per acre for non-cropland (Section I). This capitalization rate is the average gross mortgage rate for 10 of the last 12 years (disregarding the highest and lowest rates) on loans made by AgriBank, FCB in North Dakota, as specified by state law.

The line labeled "Acreage as provided by county" (Section J) is the number of acres the county director of tax equalization reported for cropland and non-cropland on the county's tax rolls. These acreages are multiplied by the value per acre, summed, and divided by the total acres to determine the average value per acre of $138.93 for all agricultural land in Adams County (Section K).

This last step is significant if the proportion of cropland to non-cropland acres is different from what has been used in the preceding computations. This computation also is based on the assumption that the average landowner's share of revenue per acre for crops not reported by NASS is the same as the average for crops that are reported by NASS. Finally, this step addresses the concern that the number of reported acres of agricultural land fluctuates more than the number of cropland and non-cropland acres listed on the county's tax rolls.

How the Values Are Used

The results of the analysis are provided to the North Dakota Tax Department by December 1 of each year and are shared with the county directors of tax equalization. The county tax equalization boards use these results to assess agricultural land in the county. It is the responsibility of the local officials to determine the value of individual tracts based on their physical characteristics. The model does not consider the characteristics of individual land tracts; nor does it determine the value of individual tracts.

Any adjustments above or below the county average value when applied to individual tracts of land are made at the local level. Individual counties use different methods to make this adjustment. However, the average assessed value of agricultural land in the county must be within 5 percent of the county average value calculated in the model. It also 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 values for tax purposes on the revenue generated by the land, rather than its market price.

What Causes the Values to Change

The two major factors influencing land values in the model are the gross returns the land generates and the capitalization rate.

Gross Returns -- The land valuation model is designed to reflect current production and, therefore, the revenue being generated by the land. However, since yields and prices of agricultural commodities vary, multi-year averages are used to make the computations. Gross returns and the landowner share of gross returns are calculated based on the latest six years of available data. The high and low years are dropped and the remaining four years used to calculate an average gross returns. Using an average reduces variability, but does not eliminate the possibility of a substantial change in value from one year to the next. Table 1 illustrates which years' gross return data were used to calculate the value of cropland in McLean County for 1996 and 1997.

Table 1. Annual Landowner Share of Gross Returns from Cropland, McLean County

Year	Landowner Share of Gross Returns	Used for 1996	Used for 1997
	$		
1989	15,053,744	low year	n/a
1990	19,298,801	used	used
1991	18,760,229	used	low year
1992	21,492,710	used	used
1993	28,636,719	high year	high year
1994	27,184,180	used	used
1995	27,138,343	n/a	used
average (4-year)		$21,683,980	$23,778,508

Gross returns for 1988 and 1989 were low due to drought conditions. From 1990 to 1992, production began to recover, and since 1993, production has been at a high level in McLean County (more than $27 million). In computing gross returns for 1996, only two high production years (1993 and 1994) were included in the data set, one of which was dropped as the high year.

For 1997, data from 1995 were added, and the data from 1989 were eliminated. Three of the four years used in computing the average remained the same. However, the data from 1991 was dropped as the low year and replaced with the 1995 data, which was 50 percent higher. This increased the four-year average gross returns by more than $2 million (almost 10%). As the average gross returns increases, so does the value of land. Eliminating the drought years of the late 1980s, for example, dramatically impacts the land values as calculated by the model.

Data for the most recent year are not available until spring or summer of the following year. Consequently, information from the current year is not used in calculating the estimated land values. For example, the 1996 data were unavailable for preparing the 1997 report that was completed in December, 1996. The result is a time lag in the data used to estimate the land values.

The combination of the time lag, disregarding the high and low years, and using a four-year average can lead to some unexpected results. For example, some areas of the state had a relatively poor crop in 1995, yet the estimated land value increased. An example is Walsh County. Table 2 lists the landowner share of gross revenue from cropland for 1988 through 1994 for Walsh County, and the 4-year average revenue used to estimate cropland values for 1995 and 1996. Even though 1995 may have been a relatively poor year (the data are not shown in this table because they were unavailable at the time the 1996 report was prepared), it does not impact the 1996 estimated land value. Furthermore, once the data are available, they may be disregarded 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 estimated by the model.

Table 2. Landowner Share of Gross Revenue from Cropland, Walsh County

Year	Revenue	1995	1996
Date of Report		(Dec. 1994)	(Dec. 1995)
	($)	($)	($)
1988	29,813,444	29,813,444	
1989	32,122,299	32,122,299	32,122,299
1990	28,594,957	low	low
1991	35,778,198	35,778,198	35,778,198
1992	42,991,681	high	high
1993	35,373,755	35,373,755	35,373,755
1994	40,092,024		40,092,024
1995	unavailable		
average (4-year)		22,181,283	23,894,379

Capitalization Rate -- The four-year average of the landowner share of gross returns per acre 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 (with the high and low years dropped) is used to reduce the variability resulting from fluctuating interest rates. Using averages reduces variability, yet allows the model to reflect a changing environment.

The average rate of interest on mortgage loans made in North Dakota is used to determine 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 3). The following example demonstrates the impact a fluctuating capitalization rate has on land values even though the landowner's share of gross return is constant. Assuming a constant landowner share of gross return of $31 per acre for cropland and $10 per acre for non-

cropland, Table 3 shows the calculated land values for each year.

In this example (Table 3), cropland value declines by $142 per acre from 1983 to 1993, but recovers $25 per acre after 1994. Non-cropland value declines as much as $46 per acre, and recovers $8 during the same period. 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.

The change in land values may be insubstantial for years when gross returns and the capitalization rate move in the same direction. However, during times when the two factors move in opposite directions, the impact on land values from one year to the next can be quite substantial. Likewise, the change in land value could be substantial if the gross return or interest rate of the most recent year differs considerably from that of 7 or 13 years ago.

Table 3. 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 - 1997

Year	Annual Rate	Capitalization Rate	Cropland Value	Non-cropland Value
	%	%	$/ac	$/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	n/a	10.76	288.10	92.94
1997	n/a	10.47	296.08	95.51

Issues

The use of the model occasionally raises some questions. For example, do the percentages of gross revenue attributable to landowners (as specified in the statute and used in the model) reflect the current situation? Do recent advances in production technology warrant adjusting these percentages? Is the method of analysis appropriate for irrigated land? If the answer to such questions is no, the legislature may want to amend the statute.

Another question is whether the number of years of data used in the model should be changed. Expanding the number of years of data used to compute the averages used in the model (for example, 10 years of gross returns rather than 6 years) will reduce the variation in land values. As a result, land values calculated by the model would

increase more slowly during periods of increasing revenue and decrease more slowly during periods of declining revenue.

Likewise, the impact of changing the model to alter 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 (for example, agricultural land and non-agricultural properties) if changes in the value of property among categories are not in equal proportions.

This Year's Changes

Despite efforts to keep the model's parameters constant to minimize fluctuations from year to year, there are times when changes are necessary. Several changes were made this year. First, regional crop prices were used if reported by NASS. Regional crop prices reflect quality differences that may exist among the crop reporting districts. If regional prices were not available, the state price was used (as in the past), but the model no longer adjusts for transportation costs. The data used to estimate transportation cost are now quite dated.

A second change was to use NASS livestock prices because USDA discontinued reporting West Fargo prices. NASS appears to be the best source for North Dakota livestock prices.

A third change was to calculate the county average value of agricultural land using cropland and non-cropland acreage provided by the counties. There had been some concern in recent years that solely relying on acreage reported by USDA could affect results. In response to this concern, each county reported the acreage on its tax roll for use in the model. However, acreage provided by the USDA continues to be used to calculate the value of cropland and non-cropland in each county.

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 continued to be "fine-tuned" to reflect new legislation, concerns of local tax officials, changes in data sources, and trends in the agriculture industry.