Ohio CAUV Value Projections for 2018

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Key Findings

The purpose of this report is to provide projections for 2018 for the CAUV values of all soil types in Ohio enrolled in the Current Agricultural Use Value Program (CAUV). Further, the CAUV formula that is used to calculate CAUV values based on soil types is explained, along with the components of the formula and the assumptions that are used to make average, high, and low CAUV value projections for 2018. Recent legislation passed in 2017 made changes to CAUV calculations, which are detailed here as well as previous procedures and current methodology.

Key Findings

- The average CAUV value across all soil types in Ohio is anticipated to fall to $1,023, which is an 11.2% decline from the average 2017 CAUV value of $1,153.
- 2018 is the second year of the phase-in of large-scale CAUV changes which began to be applied during the 2017 tax year. If the phase-in procedure was not in place, then the average 2018 CAUV values would have further dropped to around $893.
- Due to uncertainty in finalized input data used in the 2018 CAUV calculations, it is possible for the average CAUV value to decline by as much as 20.6% while it is also possible for the average CAUV value to rise by over 20.6%. However, an increase in CAUV values for 2018 is viewed as unlikely.

CAUV Value Projections for 2018

In 2017, the average CAUV value across all soil types per Ohio Department of Taxation (ODT) was $1,153. Due to the nature of how CAUV is calculated, our projections for the 2018 average CAUV values can have a high of $1,391 and a low of $916. Our expectations are for the average value of CAUV to be around $1,023. ODT provides general information on their calculations for CAUV and how they calculate the CAUV value for each soil type across Ohio. Their information also includes the official values of inputs that ODT uses in the formula for CAUV values.

Our expectations for the CAUV values for the 2018 tax year are for commodity prices, costs, and capitalization rate to remain largely unchanged – which is consistent with the early data on these inputs into the CAUV formula still being uncertain as of today. Under this scenario, the average CAUV value will continue to decline by a similar proportion as the fall in the CAUV values from 2016 to 2017. Every soil type in Ohio is assessed a CAUV value based on its expected yield; more productive soil types are expected to have a larger increase under this scenario than less productive soil. Grouping soil types based on a productivity index can help display how similarly productive soils are expected to decline in our 2018 projections:

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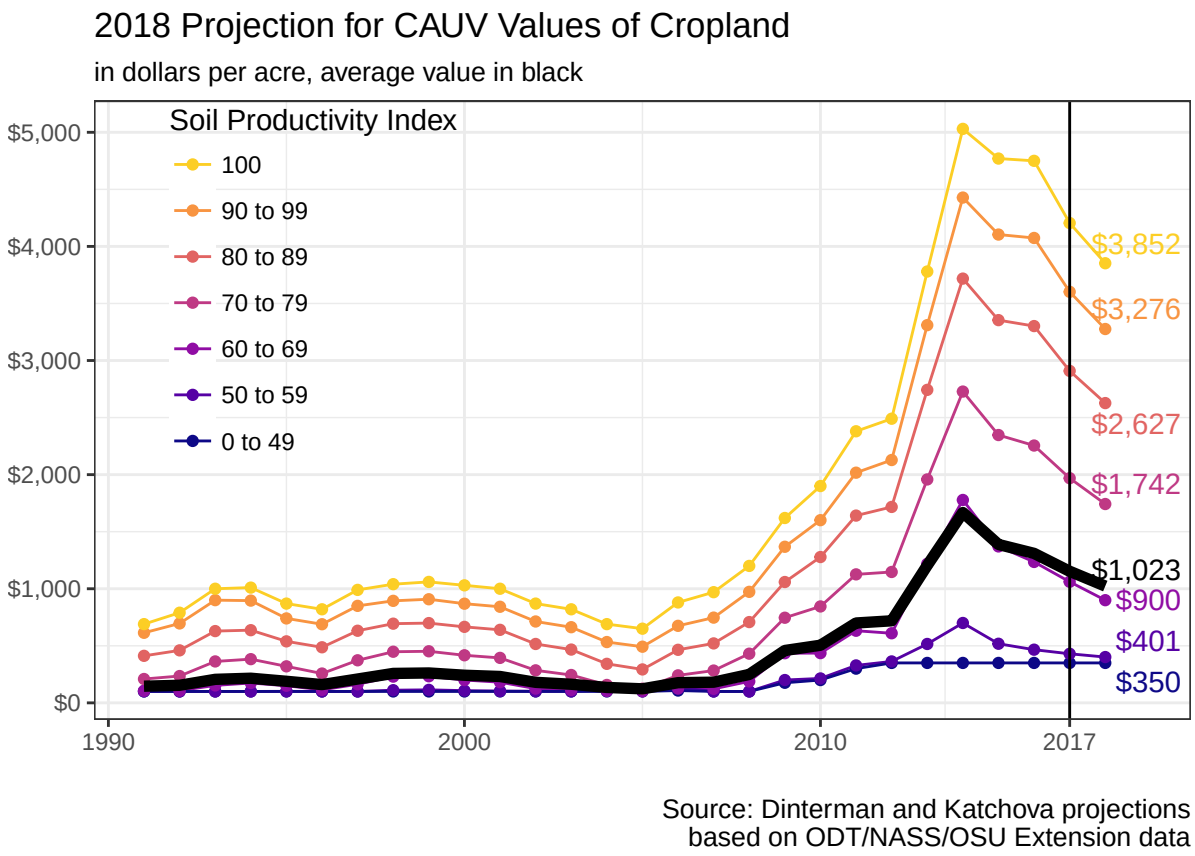

Figure 1:

Our projected CAUV values are partially offset by the current provision in the CAUV calculations that phases in the new formula for CAUV, making the adjustment to lower CAUV values smoothed over the next few years rather than these declines occurring over one year. The 2017 values had an adjustment factor where only half of the difference was included between the 2016 CAUV value and what the pre-adjusted 2017 CAUV would have been. This also occurs for 2018, where if the calculated CAUV value in 2018 is lower than the 2017 CAUV value for a soil type then only half of the difference is factored into the actual 2018 CAUV value. Figure 2 below shows how much this adjustment for phasing in of the new calculations differ by soil types:

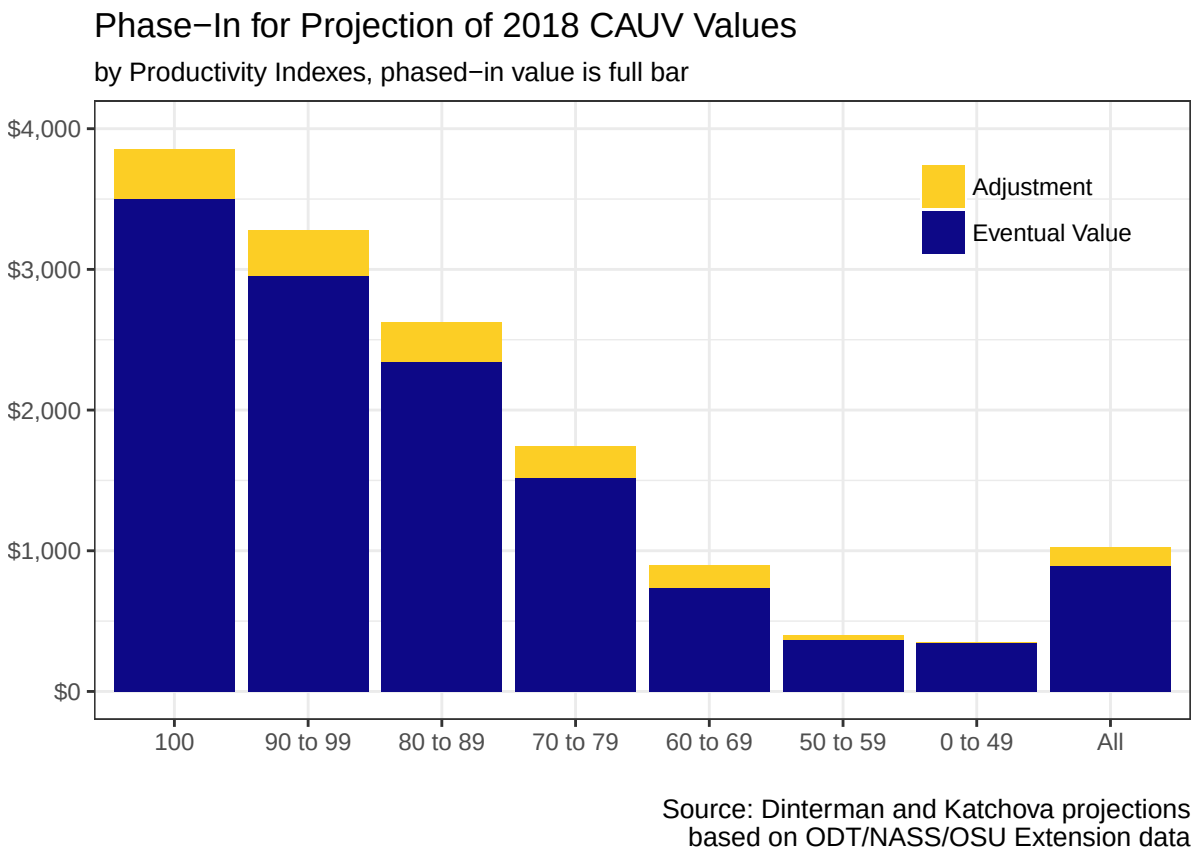

Figure 2:

Sensitivity Analysis for High and Low Projected CAUV Values

In order to provide sensitivity analysis for our assumptions, we provide high and low projected CAUV values.

For the high projected values to occur, the capitalization rate needs to decline, nonland costs need to fall, and commodity prices need to rise. If all of these factors were to occur, this would cause the 2018 CAUV values to rise higher than the 2017 values – which were the lowest values since 2012. As in the previous graphs, below is a graph on potential CAUV value changes under assumptions leading to the highest projected values:

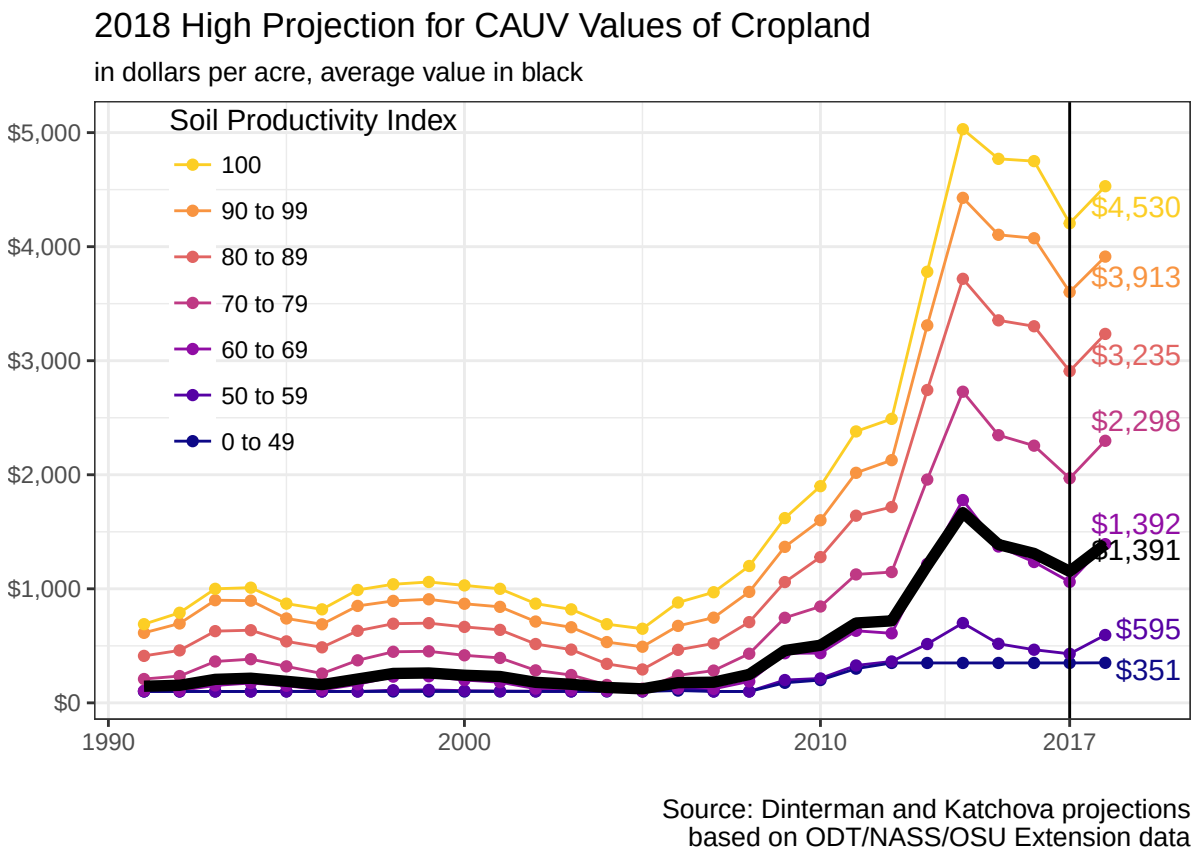

Figure 3:

However, the lowest projection occurs in a scenario where essentially the opposite happens: the capitalization rate increases, nonland costs increase, and commodity prices fall.

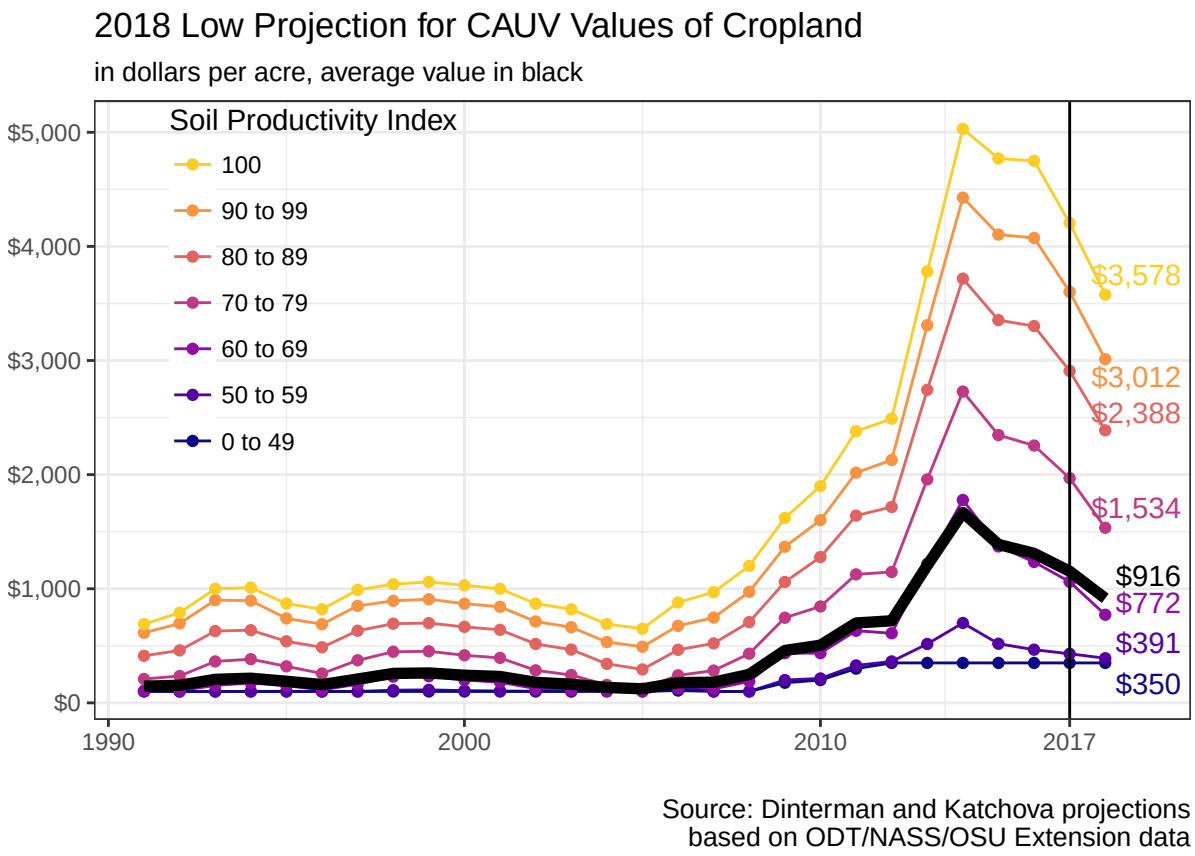

Figure 4:

The low projection is also partially offset by the current provision in the CAUV calculations that phases in the new formula for CAUV:

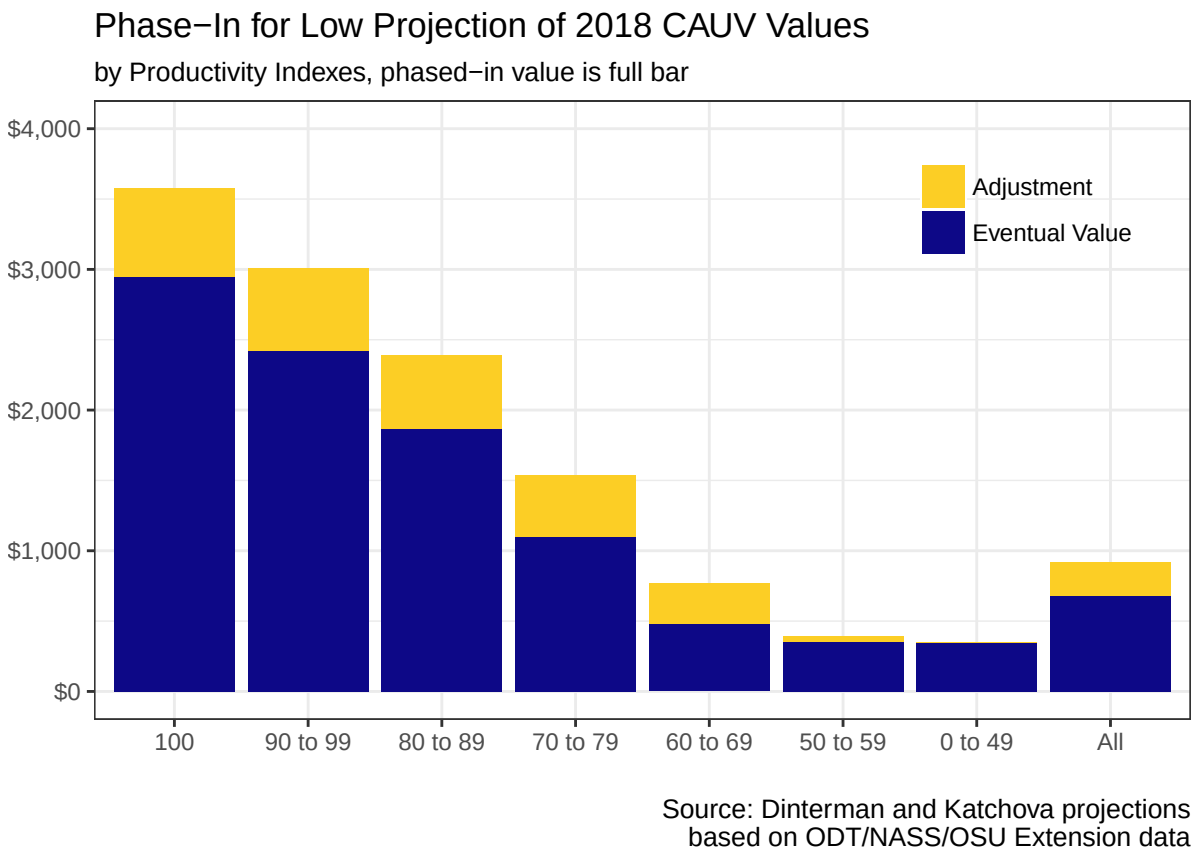

Figure 5:

We explain the current methodology for calculating CAUV values and how these projections were made. We used ODT descriptions of calculations, the Ohio Code of legislation on CAUV, and the phase-in legislation for the new calculations.

Current Agricultural Use Value Program Overview

In 1974, Ohio enacted the Current Agricultural Use Value Program (CAUV) as a tax incentive for farmers to continue agricultural production on their land instead of selling it due to urbanization pressure. CAUV provides an appraisal method for valuing agricultural land by use of only agricultural inputs rather than the market value of land. Throughout the 1970s, other states adopted similar programs of differential appraisal methods of agricultural land and, as of 2014, all 50 states within the US provide some form of differential tax treatment of agricultural land. While each state has its own reason for enacting preferential tax treatment and its particular calculation, the intent behind differential taxation is generally understood as applying a net present valuation of agricultural production that is not tied to potential urbanization development pressures. Ohio is no different and has developed its own calculation method that depends on soil quality, commodity yields/prices/rotation, operational costs, and capitalization rate. The basic premise has been in place since the late 1970s although the program has become more sophisticated and received substantial updates in 2006, 2015, and most recently in 2017 that have affected the calculation of CAUV.

No matter what commodity a farmer produces, their CAUV value is determined solely based on their soil type and a formula from the Ohio Department of Taxation (ODT) which aims to represent the expected returns for an average farmer in Ohio. A simplified version of the calculation can be stated as:

> The CAUV value is the expected net present value of an acre of land based on expected net income of the land used for agricultural purposes. To determine this, first a historical average of yields and prices for corn, soybeans, and wheat is used to determine gross income. Then historical non-land costs – provided by The Ohio State University Extension – are subtracted from gross income for a measure of net income. And finally, this net income is divided by a capitalization rate based upon historical values of farm interest and equity rates. This CAUV value will vary based upon the particular soil type(s) for a farm.

For agricultural land to be eligible for CAUV, it must either be at least 10 acres devoted exclusively to commercial agricultural use or be able to produce more than $2,500 in average gross income. The general trend for the state of Ohio since the 1980s has been a steady increase in the total acreage enrolled in CAUV, although there have been declines in enrolled CAUV acreage for areas under urbanization pressure as farmland is converted to residential or commercial purposes. When a land owner decides to unenroll from CAUV for this purpose, they must pay a recoupment penalty that is equal to the CAUV tax savings for the previous 3 tax years – i.e. the difference between the market value and CAUV value.

CAUV Value Formula

The only factor that varies spatially in CAUV calculations is soil types across Ohio. The central and western portions of Ohio are of high soil quality relative to the rest of the state while the Appalachian foothills along the eastern portion are of lower soil quality. For each of the over 3,500 soil types (s) in Ohio, a particular year's (t) CAUV value is calculated as the soil's net income divided by the capitalization rate:

$$CAUV_{s,t} = \frac{NOI_{s,t}}{CAP_t}$$

where CAP_t represents the capitalization rate and $NOI_{s,t}$ represents the net operating income.

Capitalization Rate

Prior to 2015, the capitalization rate was based on a 60% loan and 40% equity appreciation with interest rates for each value based on a 7-year Olympic average[1] where the value for the loan interest rate came from a 15-year mortgage from Farm Credit Services (FCS) and the equity interest rate was the Federal Funds rate plus two percentage points. Both of these interest rates use the current tax year's value in calculation so the value calculated for 2014 was an Olympic average over the years 2008 through 2014. This loan/equity mix is calculated and then 5 years of equity buildup and appreciation are subtracted from the interest rate plus a tax additur – the average effective tax rate for agricultural land applied at 35% of the market value.

For the 2015 tax year, the capitalization rate changed to an 80% loan (based on 25-year mortgage from FCS) and 20% equity appreciation. Then in 2017, ODT changed the interest rate used for equity appreciation to the 25-year average total rate of return on farm equity from USDA-ERS – this amount is lagged two years so the 2017 value is based on 1991 through 2015 values. The loan interest rate remains a 7-year Olympic average that is not lagged, so the 2017 interest rate used values from 2011 through 2017. The formula dropped appreciation from calculations and changed the equity buildup calculation from 5 years to 25 years. The tax additur component remained in the calculation and between 2006 and 2017 it ranged from 1.3% to 1.6%.

The capitalization rates used by the ODT in CAUV calculations since 2003 are displayed in figure 6, which shows a steady decline until the formula change in 2015. The projected capitalization rate for 2018 is 7.94%.

In addition, the scenarios for a "high" and "low" capitalization rate in 2018 are numerically displayed in red and blue respectively. A "high" scenario implies the highest potential CAUV values, which would be a lower capitalization rate because the capitalization rate is in the denominator of the formula for CAUV. Vice-versa

[1] A 7-year Olympic average is a mean of the previous 7 values after first removing the highest and lowest values from calculation.

for the "low" projection of CAUV value. The "high" value of our projected capitalization rate of 7.8% leads to a high CAUV value whereas our capitalization rate is 8.1% for a "low" CAUV value. If the 2017 CAUV values utilized these capitalization rates, then the "high" CAUV value for capitalization rate would lead to an average CAUV of $1,165 while the "low" CAUV value would have been $1,148.

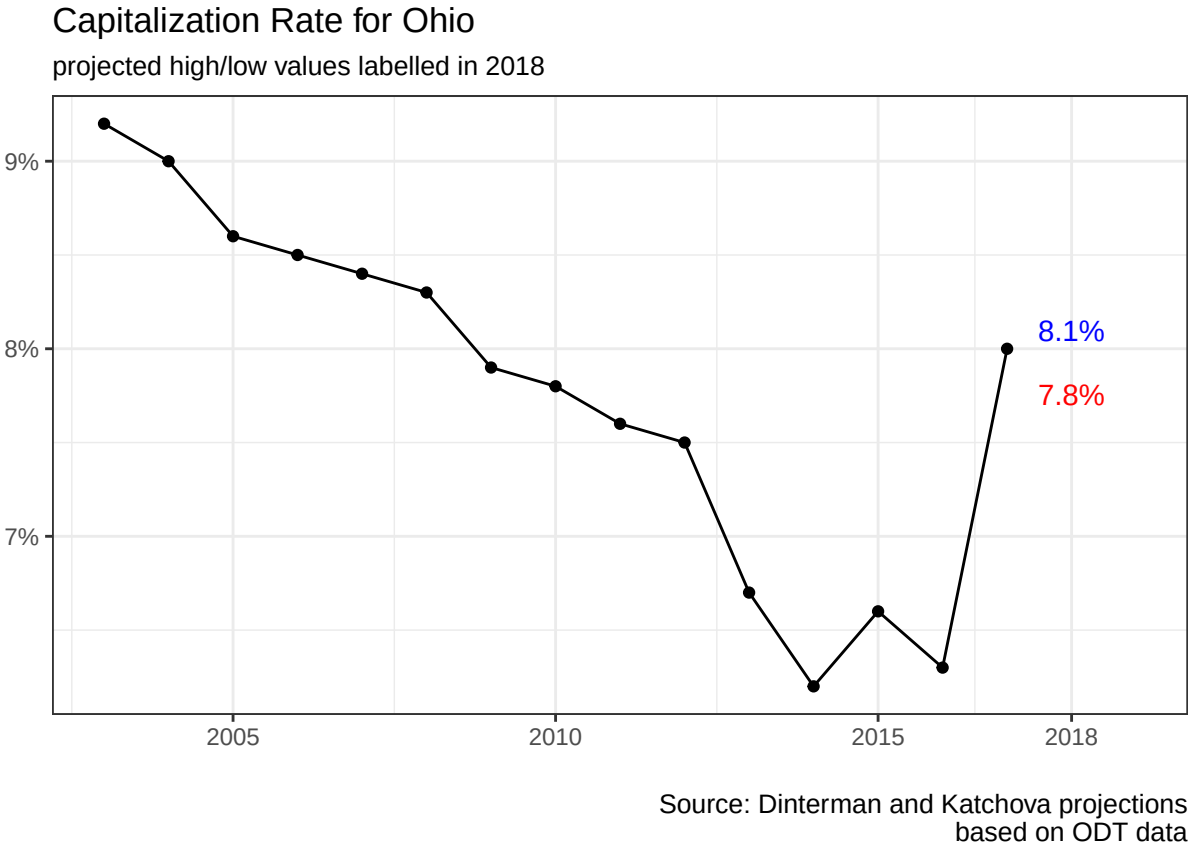

Figure 6:

Of the capitalization rate projections, only the tax additur and FCS interest rate are currently unknown for 2018. The equity appreciation rate is already known because USDA-ERS has published their 2016 value for total rate of return on farm equity – thus allowing for the 2018 tax year calculation. The 25-year mortgage from FCS uses a 7-year Olympic average, which allows for a "high" and "low" CAUV value projection. The tax additur is reported by the ODT for that particular tax year – in lieu of utilizing the Olympic average and this projection uses a +/- 0.1% range with the tax additur from the 2017 value.

Net Operating Income

Net operating income, $NOI_{s,t}$, captures the average returns to an acre of land under normal management practices which is adjusted by the state-wide rotation pattern of crops. This is defined as:

$$NOI_{s,t} = \sum_{c} w_{c,t} \times (GOI_{s,c,t} - nonland_{s,c,t})$$

where c denotes the crop type, which is either corn, soybeans, or wheat which represent the dominant crops in Ohio and $w_{c,t}$ is crop's share of state production. $GOI_{s,c,t}$ is the gross operating income for a soil type and is calculated for each of the crop types (corn, soybeans, and wheat) based on yields and prices. $nonland_{s,c,t}$

is the non-land costs associated with each crop type. Both of these variables are further explained in the following sections.

Rotation

Each crop's share of state production is based on a 5-year average of total acres harvested between the three crops – with weights summing to 1. The values are lagged one year – the 2018 values for crop rotation percentages are based on the 2013 through 2017 harvested acreage which is known at this time. The values of rotation used in ODT calculations since 2006 are displayed in figure 7 along with the values used in the 2018 CAUV value calculations.

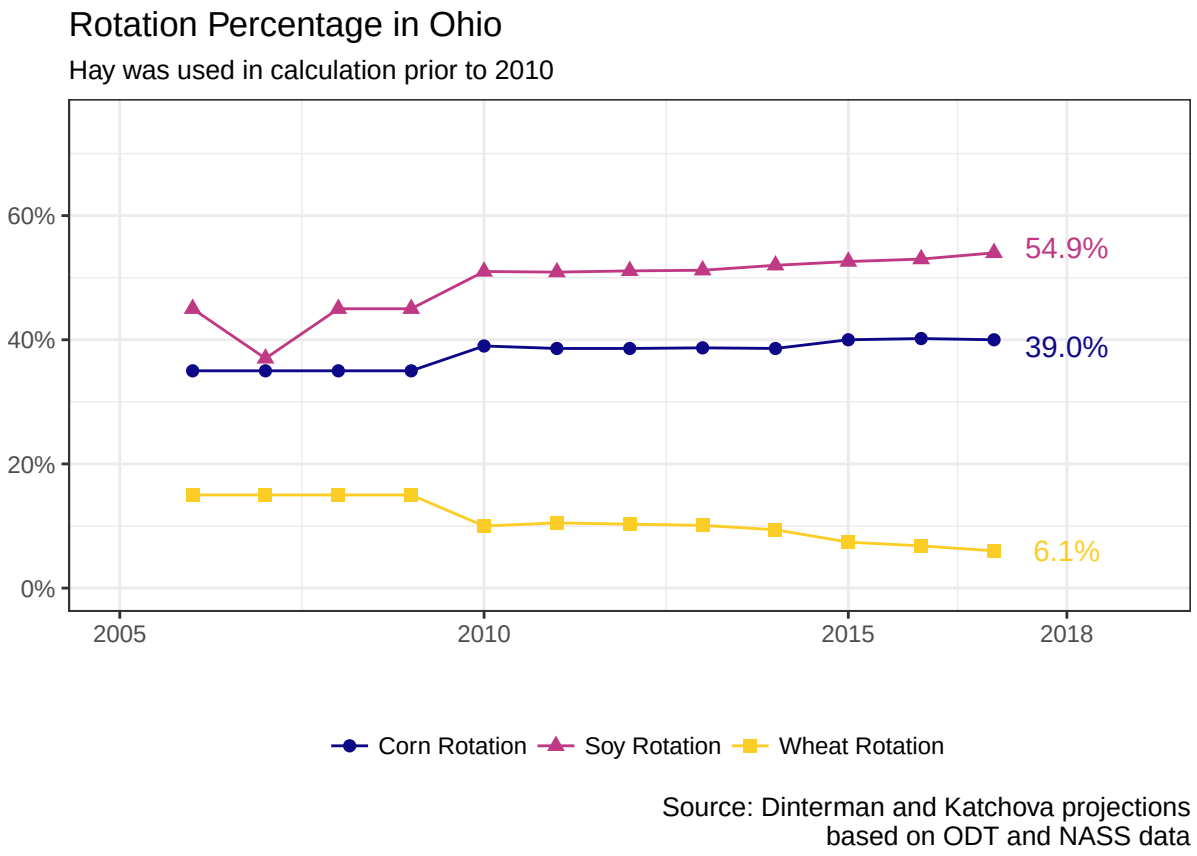

Figure 7:

Note that hay was dropped from rotation in 2010 and prior to 2010 the percentages do not sum to 100% but rather 100% minus the share that hay made up. Hay never represented more than 5% of the rotation and was dropped in 2010 due to unreliable estimates of prices and yields due to a lack of formal markets throughout Ohio.

Non-Land Costs

The non-land costs are calculated as 7-year Olympic averages for typical costs of producing each crop (corn, soybeans, and wheat). The Farm Office at The Ohio State University Extension conducts annual surveys for costs of production which serve as the yearly estimates that are used in the 7-year Olympic average. Prior to 2015, the non-land costs were lagged one year – i.e. tax year 2014 used the values from 2007 to 2013. From 2015 onward, the current year values are included in the non-land cost calculations. Because of the nature of

an Olympic average, the non-land costs used in 2018 CAUV is bounded between a "high" and a "low" value by averaging the previous 6-years after dropping only the highest or lowest value respectively. We calculate these values to place bounds on the non-land costs of each commodity. The historical and projected values are displayed in figure 8:

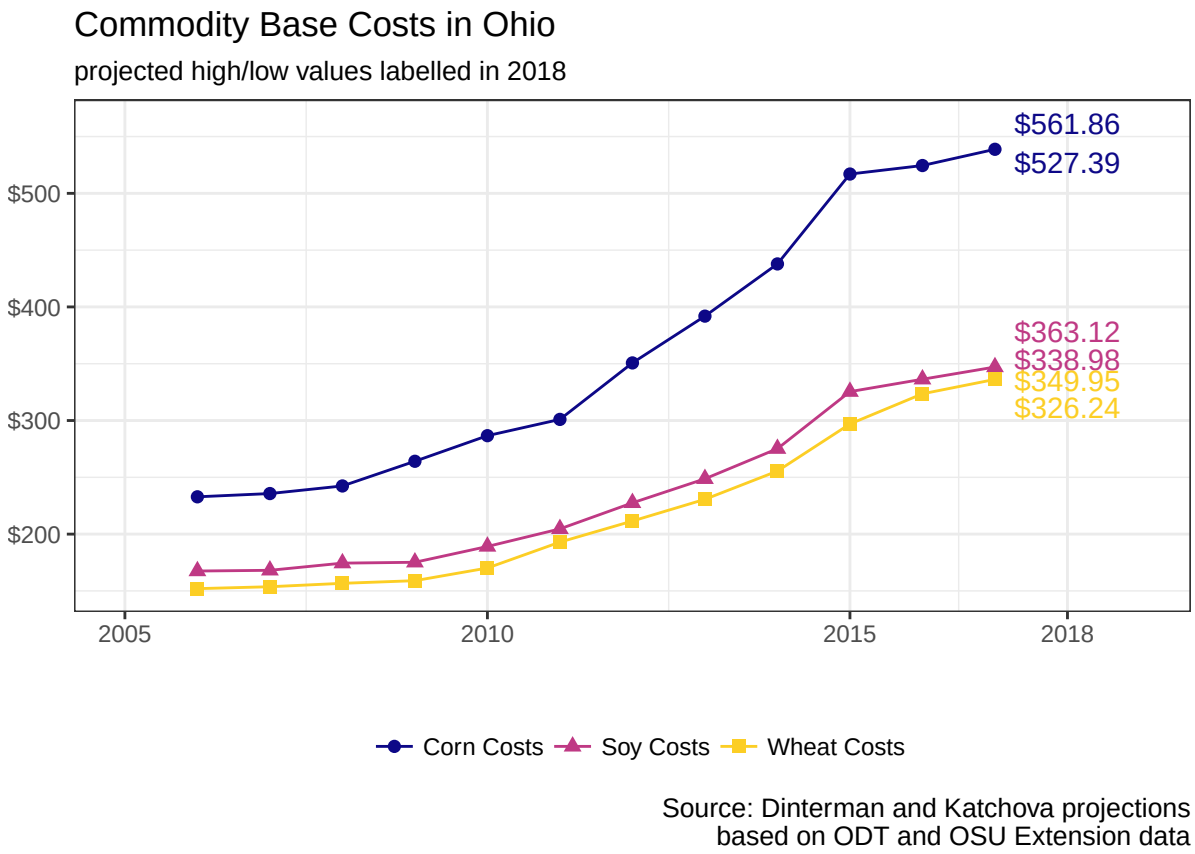

Figure 8:

A base cost is assigned for each commodity and is the same across all soil types. The base cost has an associated base yield for each commodity, which is calculated from the budget reports of OSU Extension. However, each soil type has an associated expected yield (explained in the following section) and there is an adjustment applied for each commodity if the expected yield is above or below the base yield. Each additional yield above or below the base yield is multiplied by an additional cost per yield – which is calculated in the same manner as the base costs with a 7-year Olympic average. However, these additional costs vary across soil types which makes it difficult to present for all soil types.

In the event that the "high" value of our projected non-land costs occur, then this is where the 2018 non-land costs are all the lowest values in the previous 7-years and causes the CAUV to be a higher value. The opposite is true for the "low" value in that the non-land costs are all 7-year highs. If the 2017 CAUV values utilized these non-land costs, then the "high" value would lead to an average CAUV of $1,199 while the "low" value would have been $1,088. These are of course in comparison to the actual CAUV value of $1,153 in 2017.

Our projection of non-land base costs for corn is $541.21; for soybeans is $350.52; and for wheat is $336.99 per acre for 2018.

Gross Operating Income

Gross operating income, $GOI_{s,c,t}$, is based on historical yields and prices for each crop. The gross operating income across each soil type and crop is defined as:

$$GOI_{s,c,t} = \frac{Yield_{c,Ohio,t}}{Yield_{c,Ohio,1984}} \times Yield_{c,s,1984} \times Price_{c,Ohio,t}$$

where $Yield_{c,Ohio,t}$ is an Olympic average for state-wide yields in Ohio and $Price_{c,Ohio,t}$ is a weighted Olympic average for state-wide prices in Ohio. Prior to 2015, both yield and price were lagged two years in its calculation and yields were based on a 10-year Olympic average. Since 2015, yields and prices have a one year lag and yields are now based on 7-year Olympic averages. The $Yield_{c,Ohio,1984}$ variable is a state-wide adjustment for the yields of each crop (corn, soybeans, and wheat) in 1984 to account for yield increases. And the $Yield_{c,s,1984}$ is the yield for each soil type (s) for each crop in 1984 to account for differences in soil productivity.

Prices

Prices are based on USDA-NASS data and are weighted based on state production to proxy revenues. The yearly crop prices since 1991 and values used in ODT calculations since 2006 can be seen in figure 9 along with the projected prices.

Due to the nature of Olympic averaging, the "high" and "low" projections for commodity prices can be determined for the 2018 tax year value even though the 2017 price data are not available yet. These projections are displayed as numerical values in figure 9.

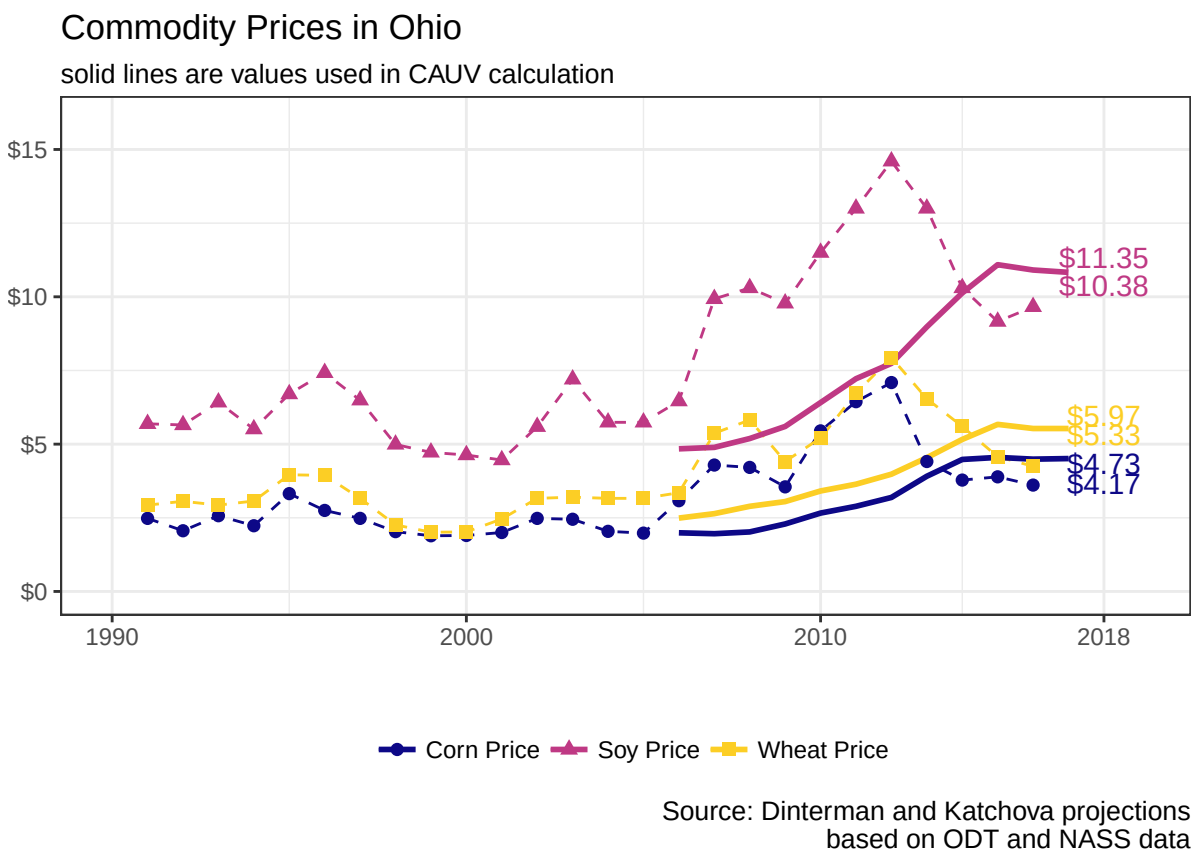

Figure 9:

In the event that the "high" value of our projected commodity prices arises, then this is where the 2018 prices are all the highest values in the previous 7-years and causes the CAUV to be a higher value. The opposite is the scenario of a "low" CAUV where the 2017 commodity prices are the lowest values in the past 7 years. If the 2017 CAUV values utilized these prices, then the "high" value would lead to an average CAUV of $1,272 while the "low" value would have been $1,037. These are of course in comparison to the actual value of $1,153 in 2017.

The crop prices for 2017 will not be known until later in 2018 when each commodities marketing year ends, however it is highly unlikely for the 2017 prices to be markedly different from their 2016 values. Due to this known information, the 2018 projected prices are: $4.34 per bushel for corn, $10.46 per bushel for soybeans, and $5.69 per bushel for wheat.

Yields

Each soil type has a corresponding base yield of production for each crop from 1984 – which is the most recent comprehensive soil survey for the state of Ohio and separate from the base yield of non-land costs. Prior to 2006, ODT did not adjust for yield trends and calculated gross operating income for each soil type via their 1984 yields thus suppressing estimated revenues. ODT began adjusting for yield trends through the current method of taking the 7-year Olympic average of state-wide yields (irrespective of soil type), dividing by the state-wide yields for each crop in 1984, then multiplying this value based on the 1984 crop yield for the particular soil type evaluated. Prior to 2014, the 7-year calculation involved a 2 year lag. In 2015 and beyond, there is only a one year lag. Therefore, the yield value for CAUV in 2017 was based on an Olympic average of yields of 2007 through 2016.

The values for commodity yields for tax year 2018 are known because USDA has published their 2017 values for each commodity and are displayed in figure 10:

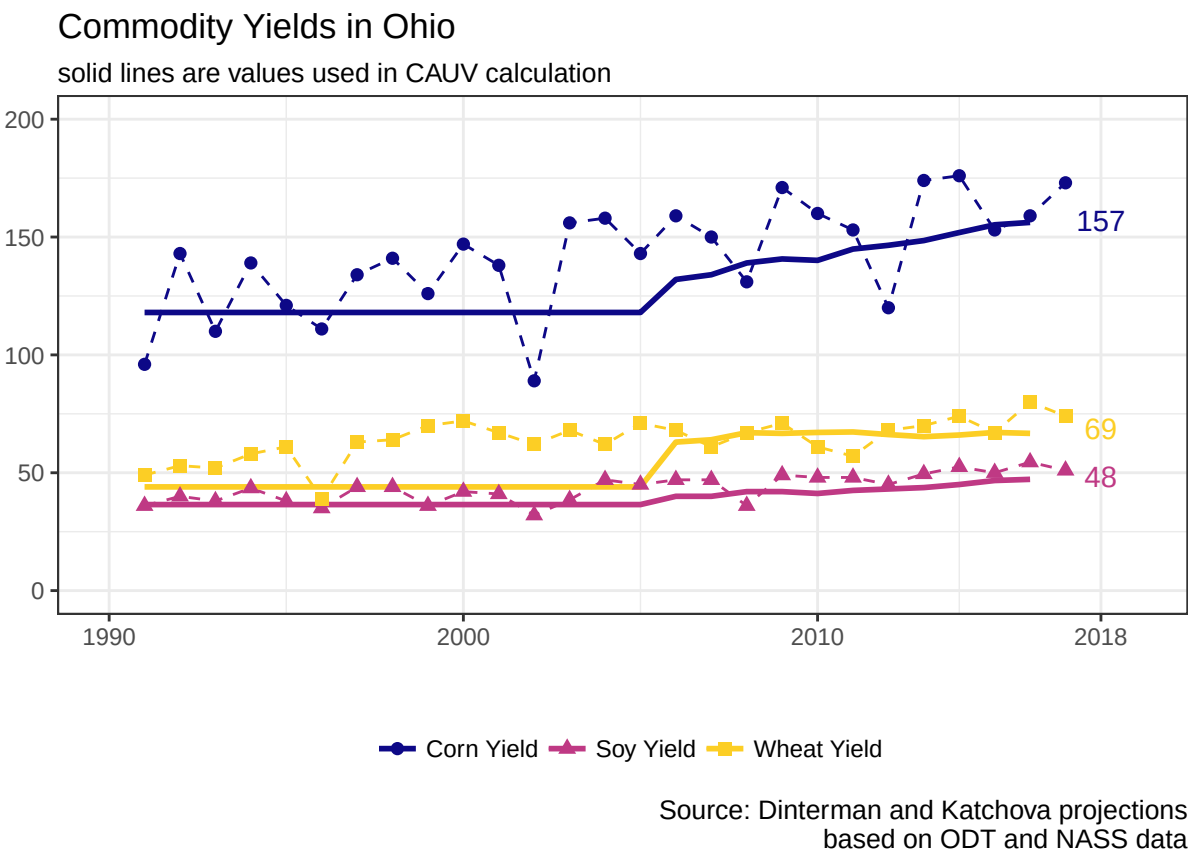

Figure 10:

CAUV Values by Soil Type

Effectively, every soil type throughout Ohio is assigned a CAUV value each year that is dependent on average corn, soybeans, and wheat revenues less costs over the previous 7 to 10 years. Soil types that have higher productive capacity – based on 1984 values – will have higher CAUV values than those with lower productivity. However, some soil types are relatively more productive with respect to one crop than the others.

ODT provides a comprehensive soil productivity index for every soil type in Ohio based upon relative yields of corn, soybeans, wheat, oats, and hay across the state of Ohio. The index ranges from 0 to 100 and provides a barometer for how productive soil types across the state are. Figure 11 places soil types in bins according to their productivity index and plots the average CAUV value since 1991 to provide a range of CAUV values. ODT provides an additional mandate for a minimum CAUV value. Prior to 2009, this was $100 but the value subsequently rose to $170, $200, $300, and finally $350 in 2012.

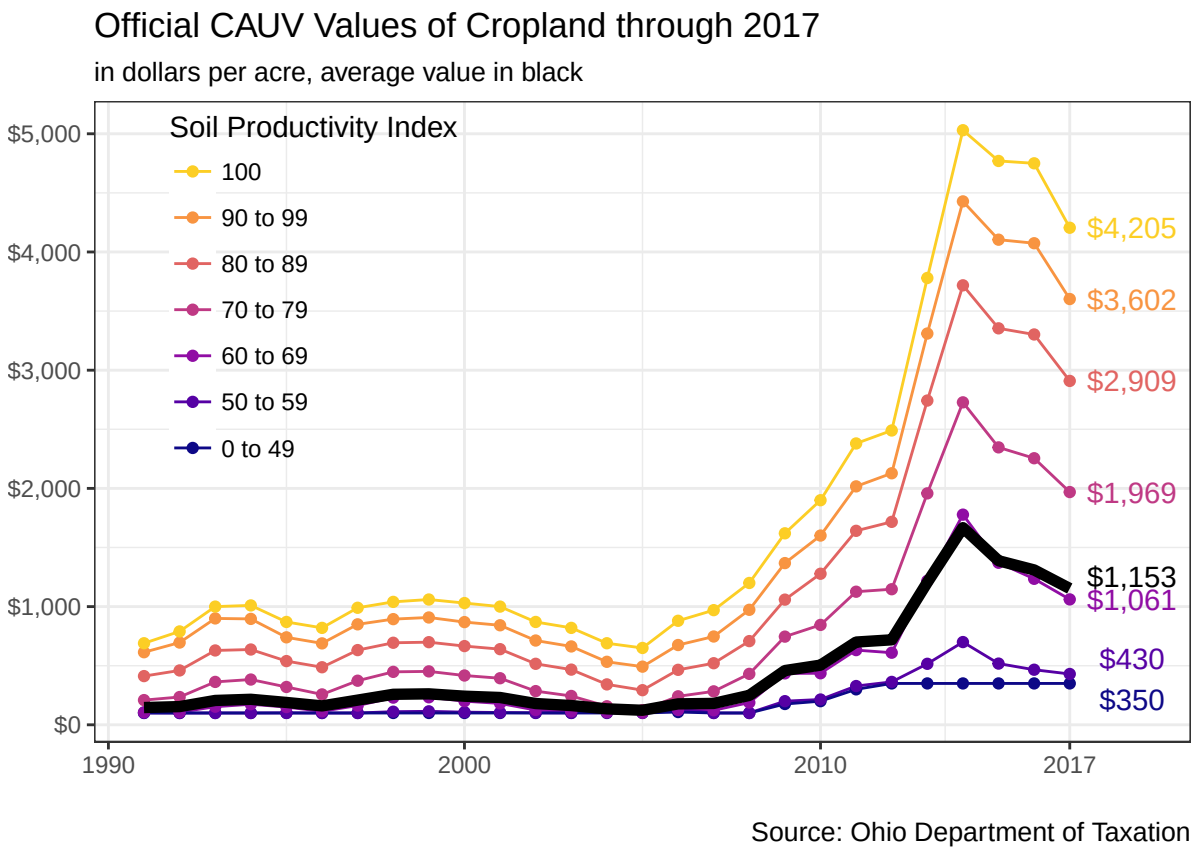

Figure 11:

Phase-In

Part of the legislative changes to the CAUV formula in 2017 was that the change in CAUV values would be phased in over time. The 2017 values had an adjustment factor where only half of the difference were added on between the 2016 CAUV value and what the pre-adjusted 2017 CAUV would have been. Figure 12 displays how the phase-in legislation affected the 2017 CAUV values across different soil types:

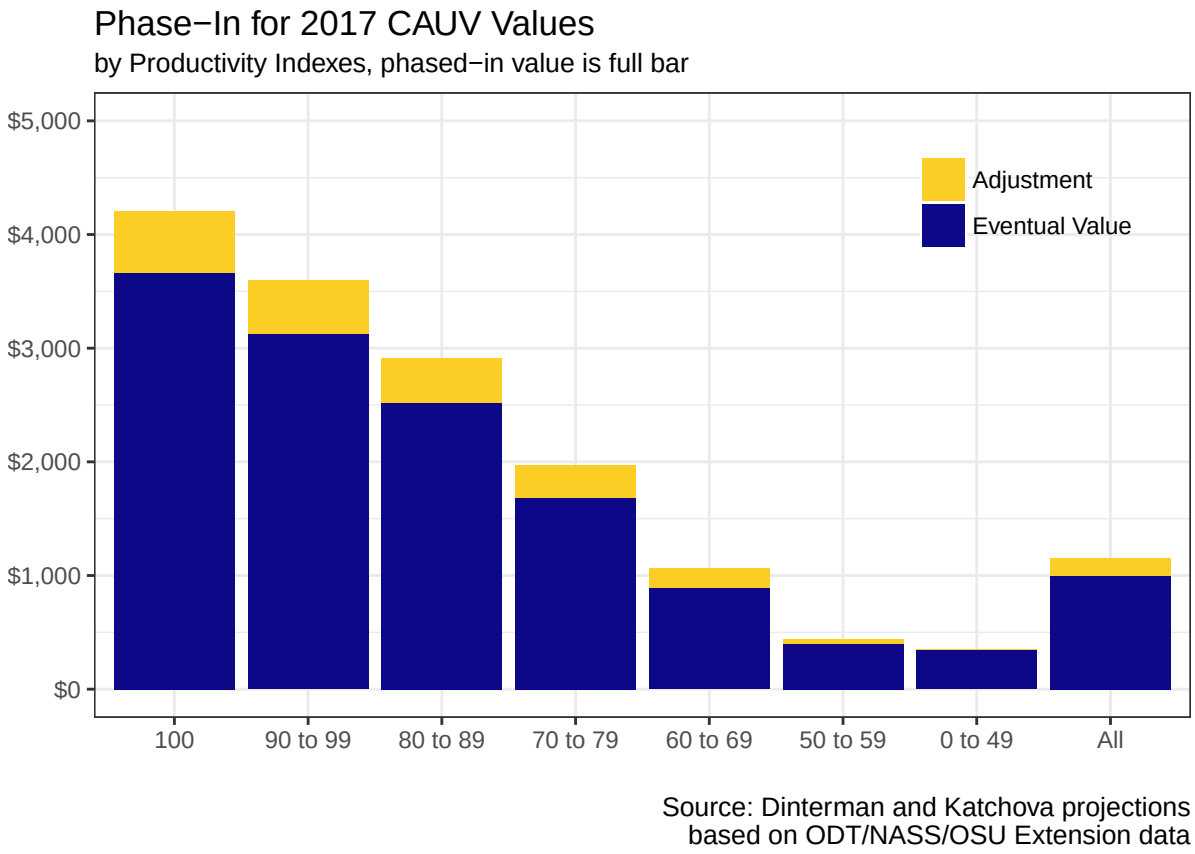

Figure 12:

Low productivity soils were largely unaffected as many of the lowest quality soils were at the minimum value for both 2016 and 2017 – $350. While the average value across all soil types in 2017 was $1,153, the adjustment associated with the phase-in period accounted for $157 on average. If the phase-in period was not in effect, the average CAUV value would have been $997.

References

- Farm Office annual crop budget reports https://farmoffice.osu.edu/farm-management-tools/farm-budgets
- Ohio Code of Legislation http://codes.ohio.gov/orc/5713.31 and http://codes.ohio.gov/orc/5715.01
- ODT CAUV Information page https://www.tax.ohio.gov/real_property/cauv.aspx
- USDA-NASS price and yield data https://quickstats.nass.usda.gov

Projections for 2018 CAUV values are available at https://aede.osu.edu/file/cauvprojections2018xlsx