

Agricultural Landlord Net Income Under Alternative Tax Computation Methods: An Update

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April 2020

This paper updates analysis completed in “Agricultural Landlord Net Income under Alternative Tax Computation Methods” (<https://agmanager.info/land-leasing/land-buying-valuing/agricultural-landlord-net-income-under-alternative-tax-computation>). It considers another method for comparison to two of the alternatives in the first version of the manuscript and provides the comparison.

Current Non-Irrigated Process

Kansas currently uses an eight-year average of an 8-year average of landlord net returns to calculate the landlord’s share of net income for non-irrigated cropland. K.S.A. 79-1476 sets the guidelines for the calculation of the landlord’s share of net income (LNI) (Tsoodle, 2018). The landlord income for a single year is based on a method of moving averages approach (Albright, Featherstone, and Cole). The method of moving averages approach smooths a time series of data such that an individual year entering or exiting the average does not have a large impact on the average. The process tends to reduce the propensity for numerous turning points where a series would move from increasing or decreasing in a limited time period.

Calculated LNIs lag the tax valuation year by two years, meaning that 2019 tax valuations are based on 2017 data. Using this example, the eight-year average is calculated from individual landlord net returns for the eight years from 2010 to 2017. Those eight individual years are calculated from an eight-year average, using information from documentable sources as directed by the Property Valuation Division. Tsoodle provides that documentation for the calculations. Information for land productivity, crop-mix, yields, prices, landlord share of expenses, production costs, and a management fee are used to calculate the LNI.

Information regarding soil productivity related to plant growth comes from the Natural Resource Conservation Service (NRCS). NRCS soil scientists developed the Soil Rating for Plant Growth (SRPG) productivity index for all soils in the United States. The information for Kansas soils is used in the LNI calculations to determine the productivity for crop growth of individual soil units relative to the average soil for the region. The soils in each county are weighted by acres to calculate the average soil productivity rating for the county. Then each individual soil rating is compared to the county average to determine if that soil is above or below average in crop productivity for that county.

The crop mix information is based on planted acres for each crop using county data from USDA’s Farm Service Agency (FSA). Only crops that constitute more than five percent of the acreage for that county



are included in the county's crop mix for LNI calculation (Tsoodle). The crop mix uses the eight-year average of eight year averages method of calculation.

Yields are obtained from either the National Agricultural Statistics Service (NASS) or the USDA Risk Management Agency (Tsoodle). The source of data has shifted over the years, due to NASS data becoming sparser over time. NASS yields are determined based on planted acres. The USDA FSA fallow acreage data are used to account for summer fallow wheat in the western two-thirds of the state. The yield information is used along with the SRPG information, discussed above, to adjust the typical yield on soils within the county. The yield calculation uses the eight-year average of eight year averages method.

The prices are also obtained from NASS (Tsoodle). The average monthly price paid to farmers at the state-level for wheat, grain sorghum, soybeans, corn, alfalfa, and sunflowers are used to convert yield into gross income. Each crop's monthly prices are weighted by the percent of the crop marketed within that month to determine the weighted annual price for the crop for the year. The price calculations use the eight-year average of eight year averages method.

The landlord's net income is required by K.S.A. 79-1476 to be calculated based on a typical crop share. A survey is conducted on a four-year rotation to determine the most common landlord share agreement for each district (Tsoodle). The survey is used to determine the typical share agreement. Once that typical share agreement is determined, the landlord's share of expenses is determined using only the crop share leases that are typical. For example, if a typical lease was 1/3 for the landlord and 2/3 for the tenant, those survey responses for the shared expenses are the average from only those surveys that had a 1/3 crop share lease.

Production costs are obtained from the bi-annual Kansas Custom Rates survey and a survey of custom applicators and cooperatives that is conducted on a four-year rotation (Tsoodle). Prices are indexed for years between the periodic surveys. These surveys provide data for the costs of raw materials (seed, herbicide, etc.) and the application costs. Finally, a management fee of 10% is deducted from gross income as an expense associated with business and management decisions made by the landlord (Tsoodle).

The above information is used to determine the landlord net income for each soil type in the state. For a more complete documentation, refer to the Tsoodle publication.

Understanding the Method of Moving Averages

The method of moving averages consists of a calculation process using an eight-year average of an eight-year average. Figure 1 provides a visual representation of the weighting process for the values used to determine the 2019 LNIs. The process requires a two-year lag due to the availability of the data from USDA. As such, the 2019 LNI uses data from 2003 to 2017. The data from 2003 has a weight of 1/64, 2004 of 2/6, continuing up to 2010 that has a weight of 8/64, after which the weight is 7/64 for 2011, 6/64 for 2012, until 2017 carries a weight of 1/64.



Figure 2 provides an example of the non-irrigated return for Atchison county from 1999 to 2017. Over the last twenty years, the net return to the landlord ranged from -\$6.36 per acre in 2003 to \$147.02 per acre in 2013. The landlord net income is not unlike other counties across Kansas where the incomes began the period at low levels, had a dramatic increase due to global agricultural profitability, followed by a varied path to lower landlord net incomes.

Table 1 provides summary statistics for the average landlord net income from 1999 to 2017 for Kansas counties. The minimum average landlord net income from \$7.09 in Morton county and the maximum landlord net income was \$119.59 in Doniphan county. The standard deviation of the individual year's ranges from \$10.46 per acre in Clark county to \$64.63 in Doniphan county. Using the coefficient of variation (standard deviation/average) as a measure of relative variability in year to year landlord net income on a county basis, the variability ranged from a high in Morton county with a measure of 175% to a low in Saline county with a measure of 46%. The range over the 19-year period was a minimum in Stevens county (\$32) and a maximum in Doniphan county (\$220). The largest year to year increase in landlord net income was a minimum of \$17.94 in Clark county and a maximum of \$127.07 in Nemaha county. The largest year to year decrease in landlord net income was \$96.71 in Atchison county and the smallest year to year decrease was \$13.40 in Ellsworth county.

Landlord net incomes are variable from year to year. The current process to calculate the landlord net income for appraisal purposes attempts to account for the variability in the landlord net income from year to year such that estimated land values for appraisal purposes do not fluctuate up and down due to the normal variability in landlord net incomes across Kansas. Reducing the year-to-year variability helps both taxing districts and land owners to budget for taxes.

Figure 3 overlays the net returns for Atchison county with the weighting structure to provide a graphic representation of the current process. That process results in the average landlord net income for Atchison County depicted in Figure 4 by the red line. From 2009 through 2017, the average LNI has been increasing at a fairly smooth rate while the individual years have had years of increasing and decreasing returns.

Adding Another Alternative Weighting Procedure

Alternative methods are examined for consideration: a five-year method of moving averages, an eight-year simple average, and a process that uses an eight-year simple average for all variables except yield that will use the eight-year moving average process (eight-year average with moving average yield). The last scenario was used previously by the State of Kansas in the 1990s. All three methods shorten the time-frame used in the calculation and/or provide a quicker adjustment to the underlying returns to the landlord.

Figure 5 compares the current 8-year moving average weighting process with a 5-year weighted average process. The length of the data timeframe is reduced by six years by using a 5-year process. The peak weight year is reduced from 8-years previous to 5-years previous. The drop-off and add-in year weights increase from about 1.6% to 4.0%. The maximum year weight increases from 12.5% to 20%.



Figure 6 compares the current 8-year moving average weighting process with an 8-year simple average process. The length of data is reduced by seven years by using an 8-year simple average. The previous eight years all have a weight of 12.5%. The drop-off and add-in year weights increased from about 1.6% to 12.5% making the average more sensitive to the relative LNI of the drop-off year compared to the add-in year. If a drop-off year or add-in year was one with a large drop (\$96.71) or large increase (\$127.07) in landlord net income, the average could fall by \$12.08 or increase by \$15.88, respectively.

The final method considered uses an eight-year simple average of prices, crop-mix and other variables, except for yields. An average of the previous eight-years of yield are used instead of the actual yield for each year. This can be considered an expectation of yield. This helps to eliminate year-to-year variability due to weather that is more prevalent in the western regions of Kansas.

Counter-Factual Simulation of Alternative Weighting Procedures

The three alternative weighting processes were applied to Atchison county and Lane county historical data. This provides a counter-factual simulation to examine how those changes would affect the average LNI for the county. Of course, many factors such as the capitalization rate and the mill levies ultimately affect the tax paid by agricultural landlords. Figures 7, 8, and 9 compare the individual years LNI (purple) with the current method for calculating the LNI (red) with the alternative methods (5-year moving average (green), 8-year simple average (blue), and 8-year average with moving average yield (pink)) for Atchison county.

Figure 10 provides a comparison of the current method (red), the eight-year simple average (blue), the five-year method of moving average (green) and the 8-year average with an eight year moving average for yield (pink) for Atchison county. Each of the methods track closely for Atchison county. The eight-year simple average bounces up and down a little more than either the 5-year moving average or the 8-year simple average with an eight-year moving average for yield.

Figures 11, 12, and 13 compare the individual years LNI (purple) with the current method for calculating the LNI (red) with the alternative methods (5-year moving average (green), 8-year simple average (blue), and 8-year average with moving average yield (pink)) for Lane county.

Figure 14 provides a comparison of the current method (red), the eight-year simple average (blue), the five-year method of moving average (green) and the 8-year average with an eight year moving average for yield (pink) for Lane county. Each of the methods track fairly closely for Lane county. The eight-year simple average bounces up and down a little more than either the 5-year moving average or the 8-year simple average with an eight-year moving average for yield.

Of the alternative methods considered, the five-year moving average and the eight-year average result in a smoother adjustment process compared to the eight-year simple average process. The five-year simple average process results in more years where the landlord net incomes increase or decrease from the previous year in more counties.



This paper discusses alternative computation methods to determine the agricultural landlord net income for mass property appraisal purposes based on an income capitalization method. There has been discussion regarding the speed of adjustment in land values under the current agricultural use-value appraisal system. The paper discusses the current computation methods, provides a graphical depiction of the adjustment process, and discusses three alternative methods to calculate landlord net income. The paper also provides information for Kansas counties on the current system and counter-factual simulation of the three alternatives.



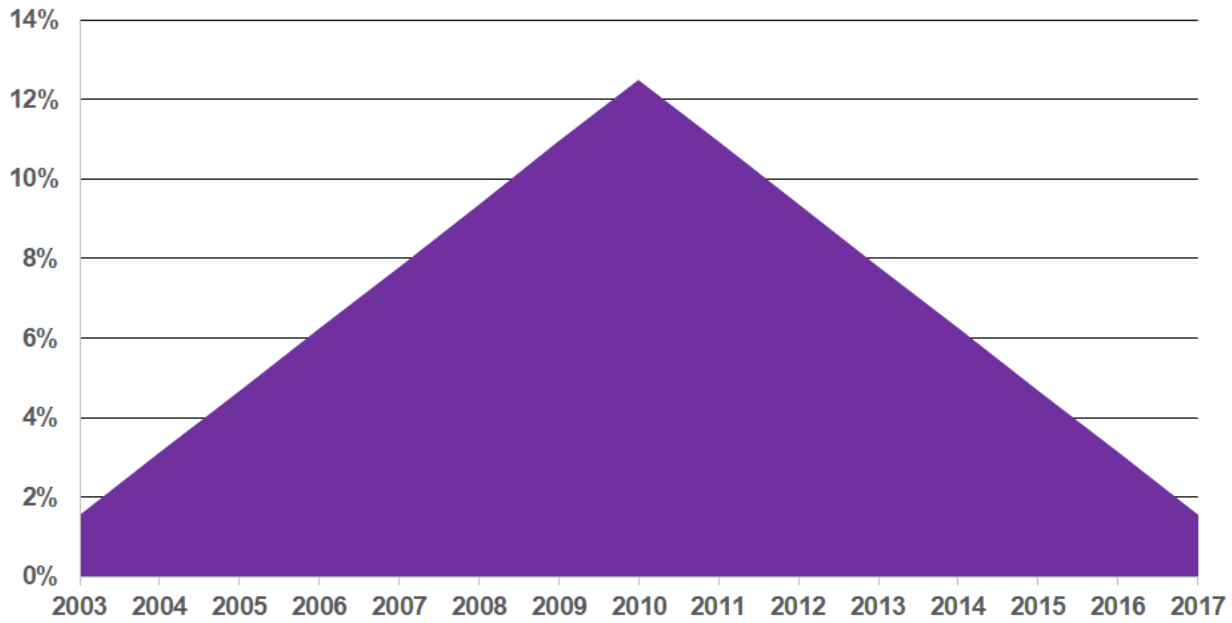


Figure 1. The LNI process of an eight-year average of an eight-year average.

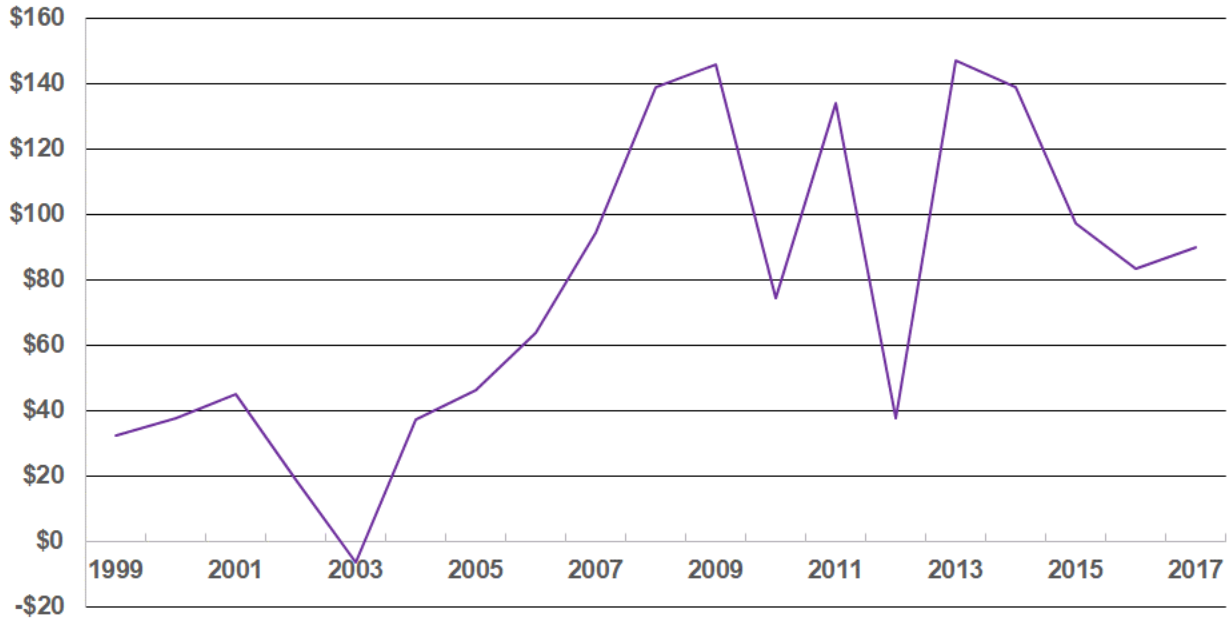


Figure 2. The non-irrigated single year landlord returns for Atchison county, 1999-2017.

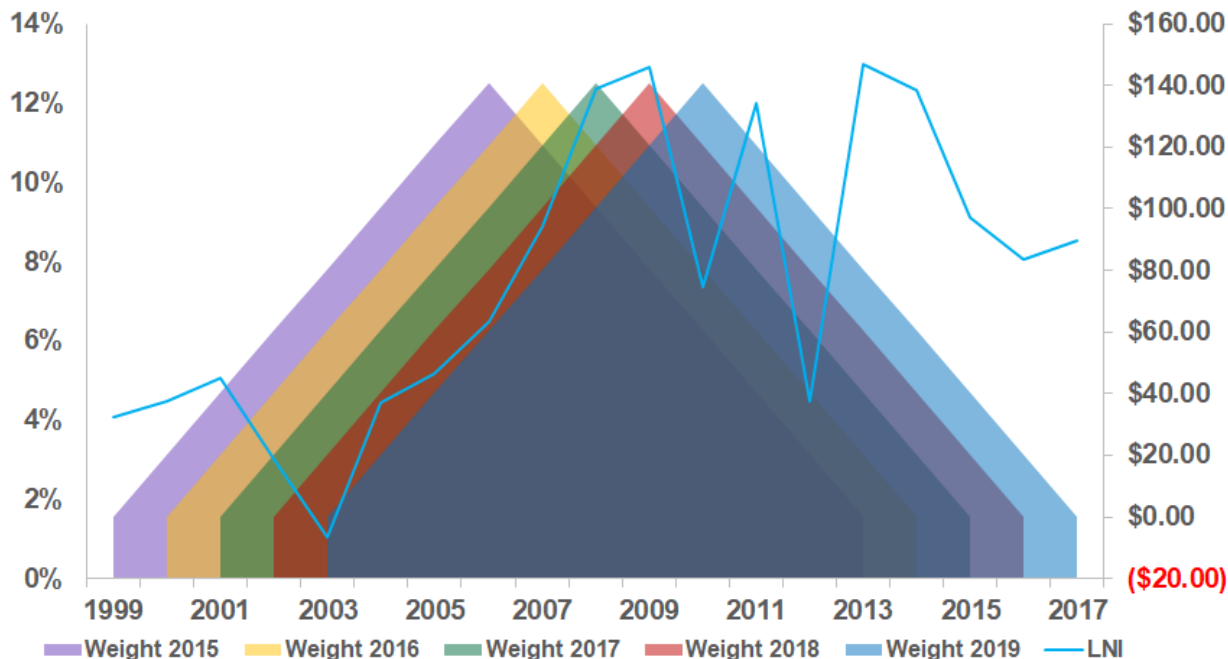


Figure 3. The eight-year moving average process for landlord returns for Atchison county.

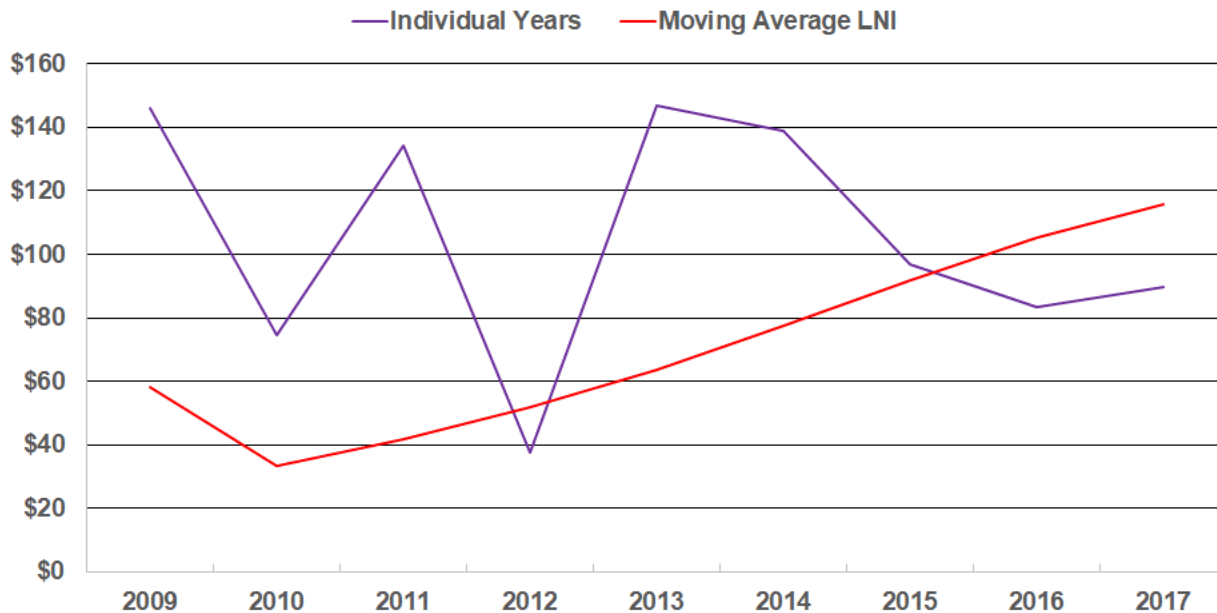


Figure 4. The eight-year moving average process for landlord (red) returns for Atchison county compared with individual years (purple).

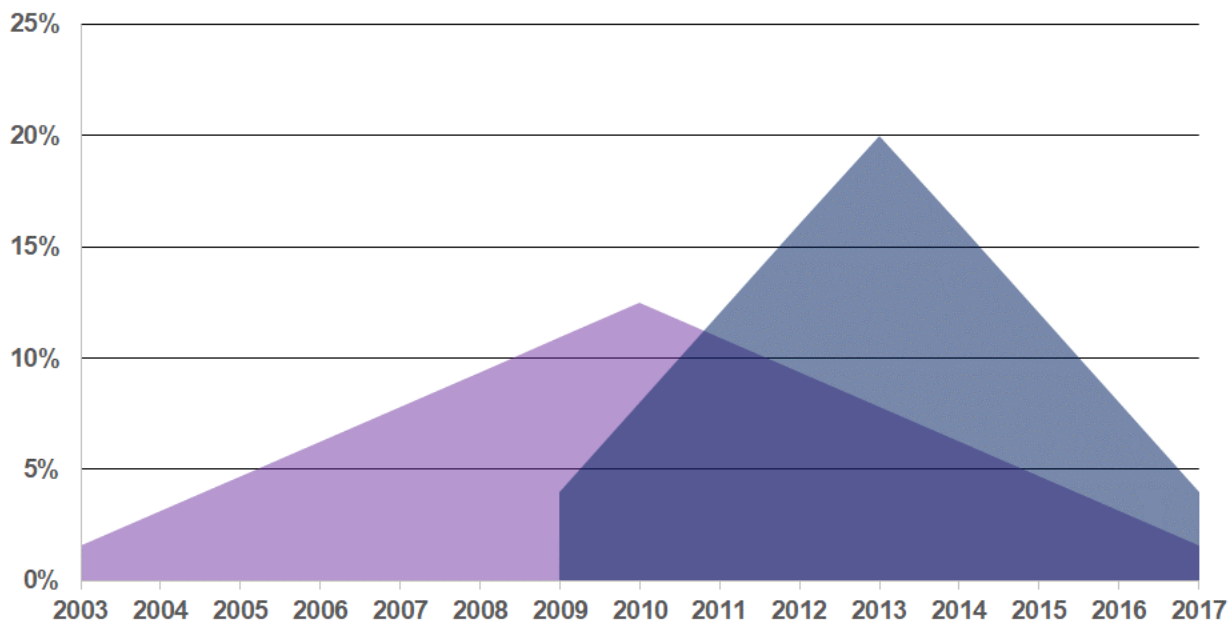


Figure 5. Comparison with the current eight-year moving average (purple) process for landlord returns with a five-year moving average (blue) process.

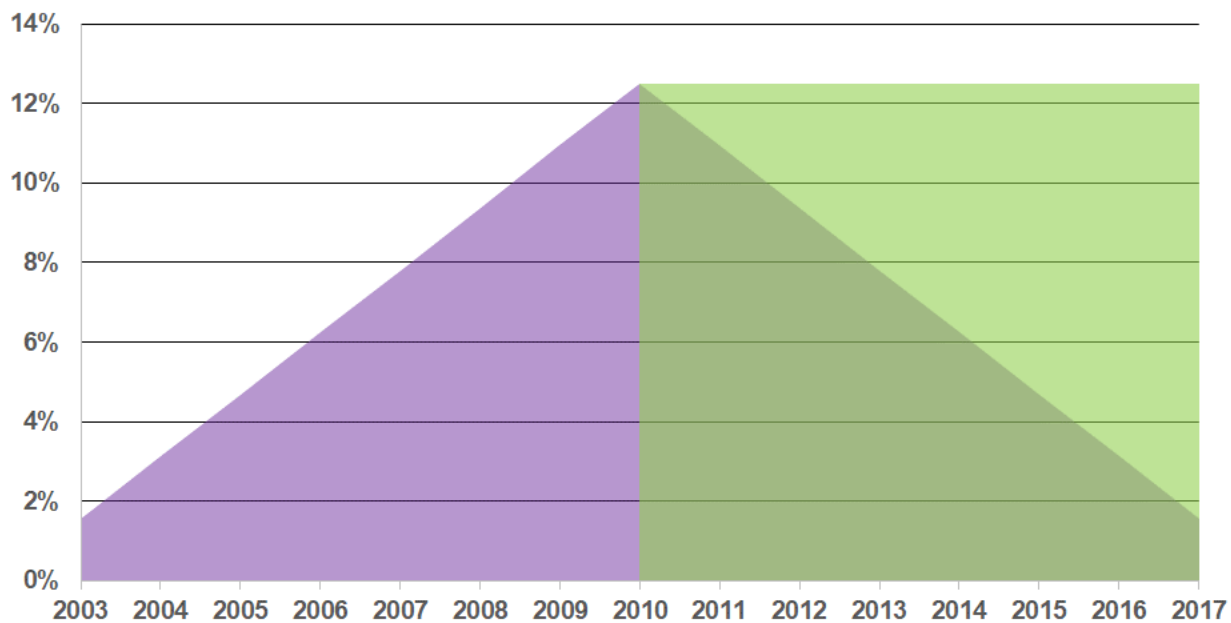


Figure 6. Comparison with the current eight-year moving average (purple) process for landlord returns with an eight-year average (green) process.

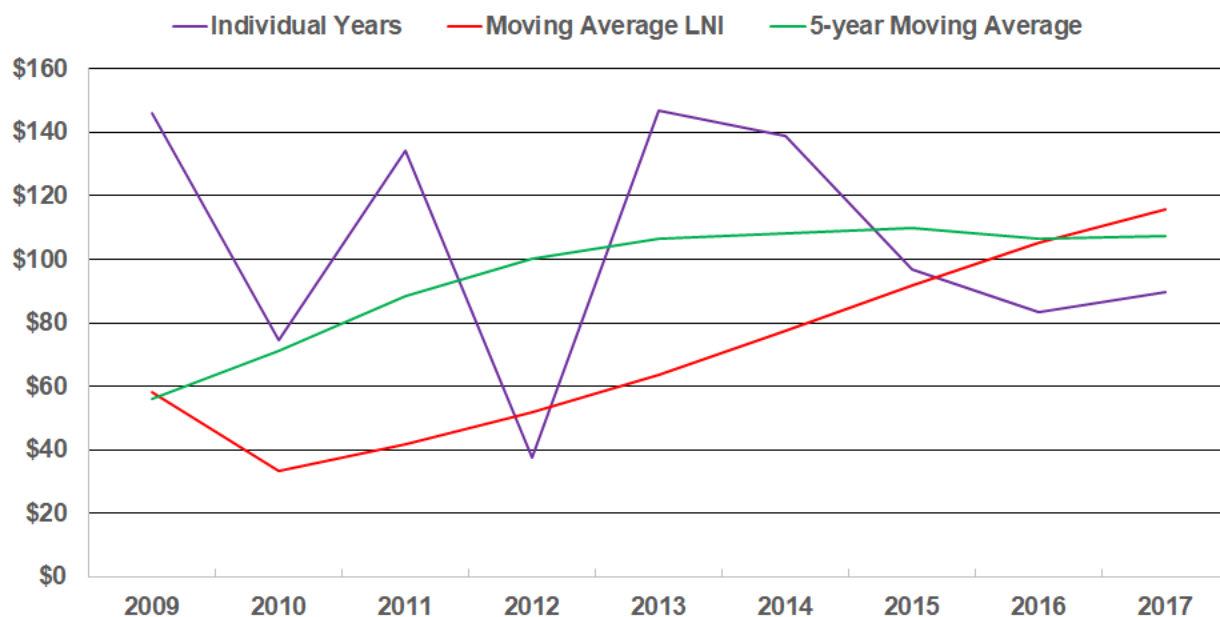


Figure 7. The eight-year moving average process for landlord (red) returns and the five-year moving average (green) for Atchison county compared with individual years (purple).

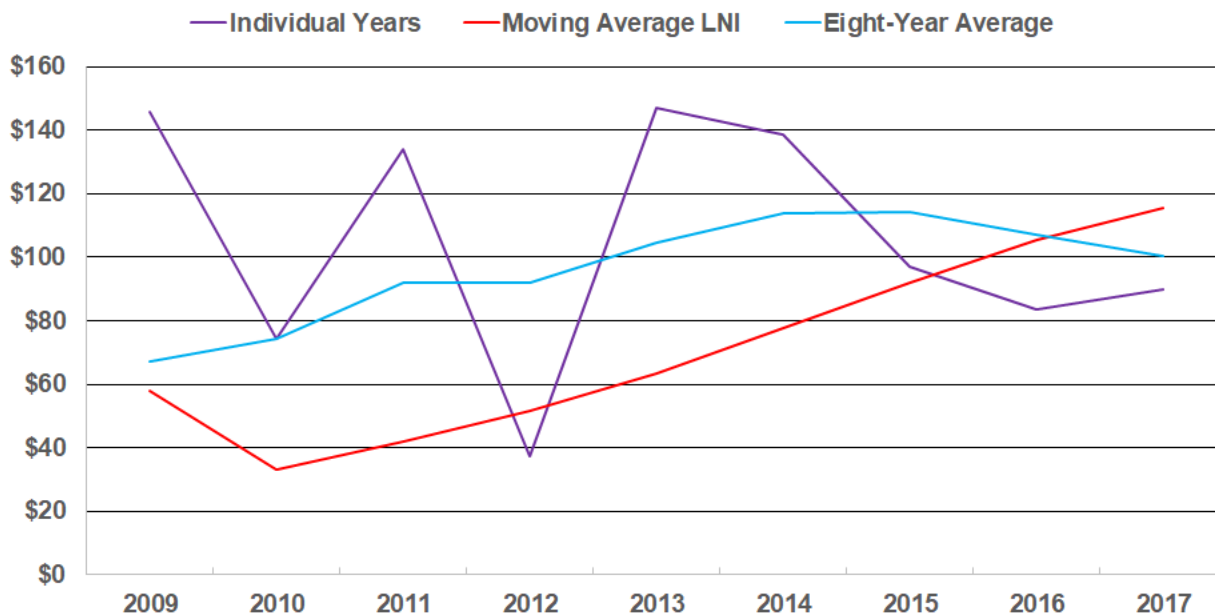


Figure 8. The eight-year moving average process for landlord (red) returns and the eight-year simple average (blue) for Atchison county compared with individual years (purple).



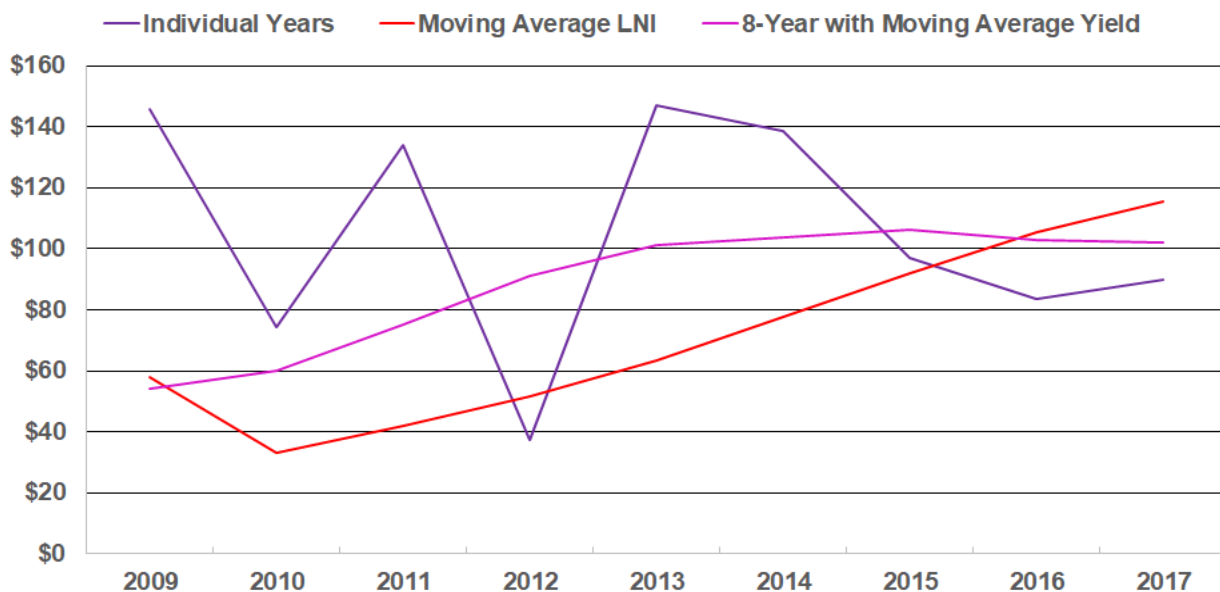


Figure 9. The eight-year moving average process for landlord (red) returns and the eight-year simple average with moving average yield (pink) for Atchison county compared with individual years (purple).

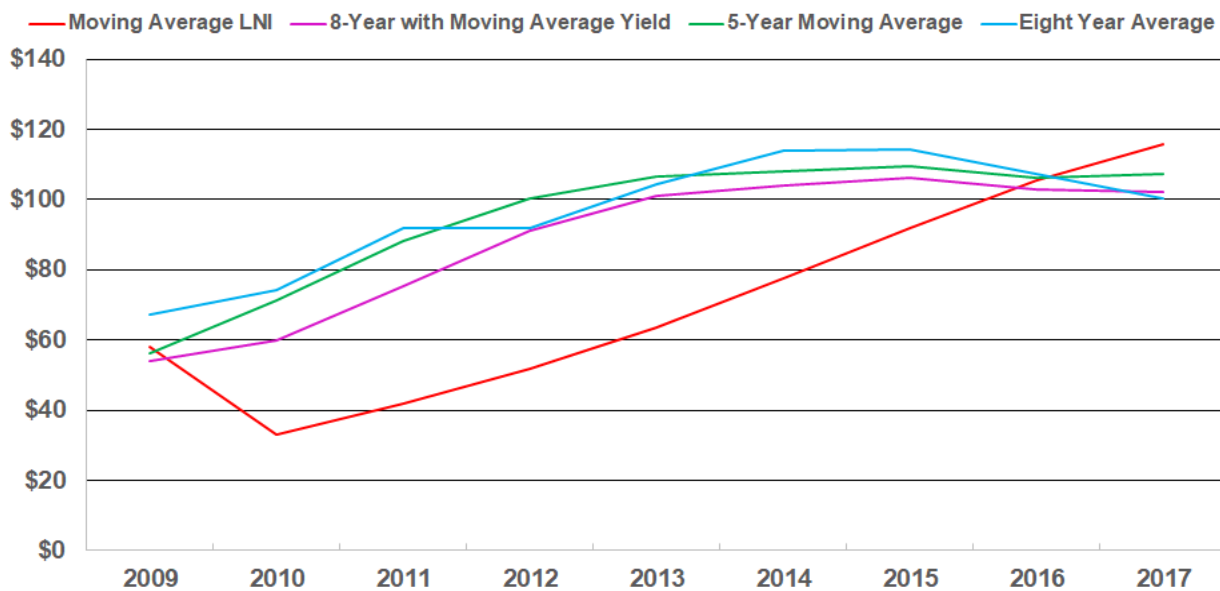


Figure 10. Comparison of the Current Method (red), the eight-year simple average (blue), the five-year moving average (green) and the 8-year simple average with moving average yield (pink) for Atchison county.



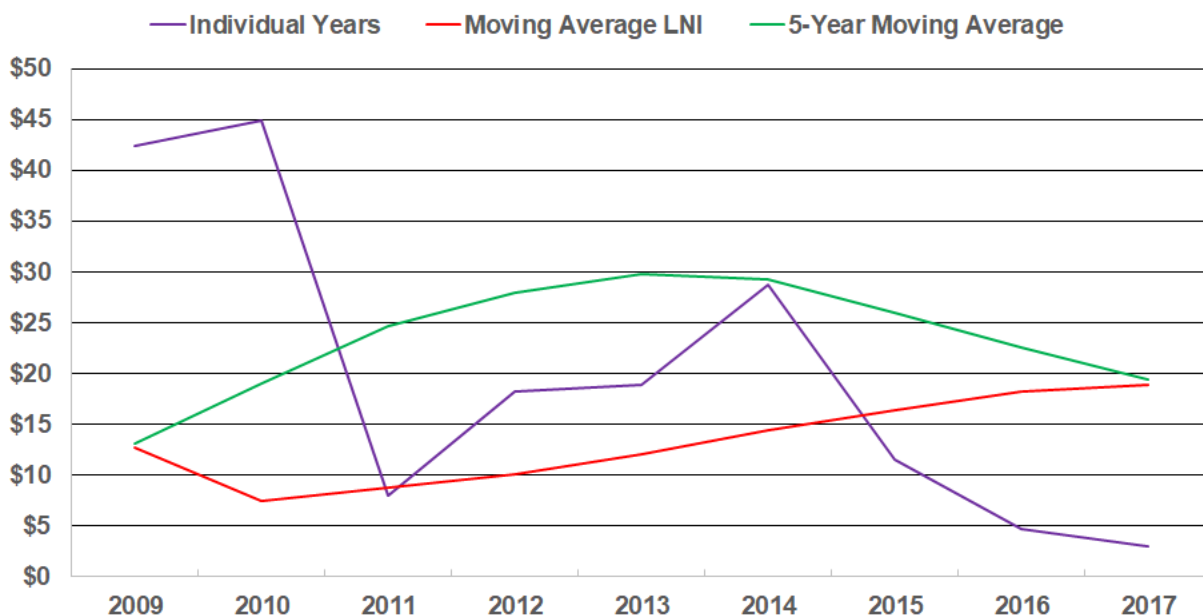


Figure 11. The eight-year moving average process for landlord (red) returns and the five-year moving average (green) for Lane county compared with individual years (purple).

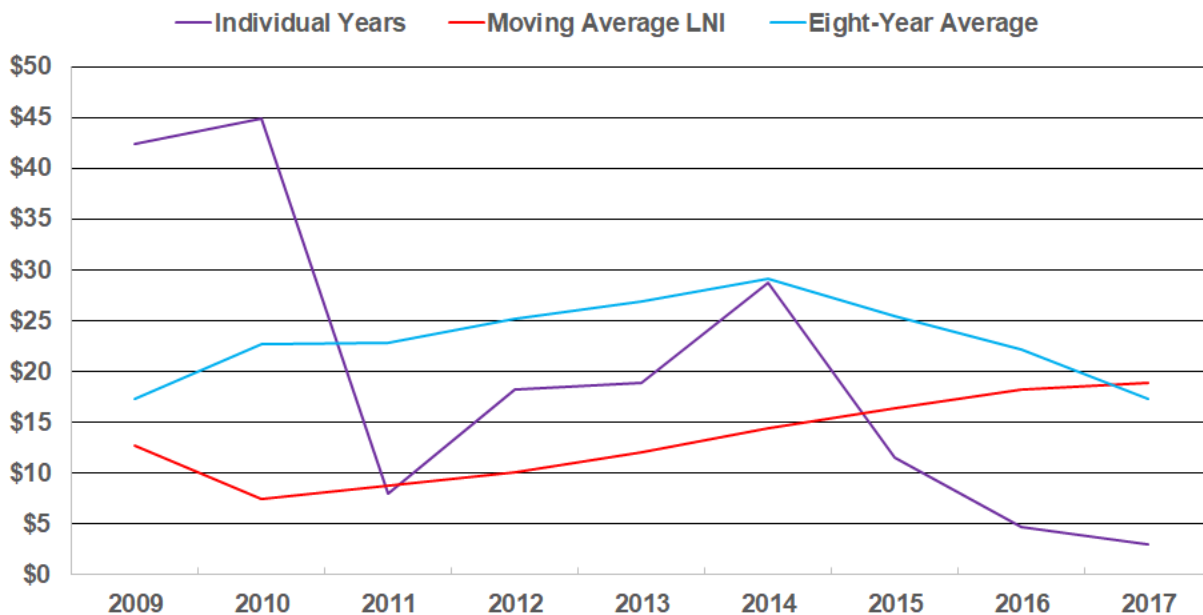


Figure 12. The eight-year moving average process for landlord (red) returns and the eight-year simple average (blue) for Lane county compared with individual years (purple).



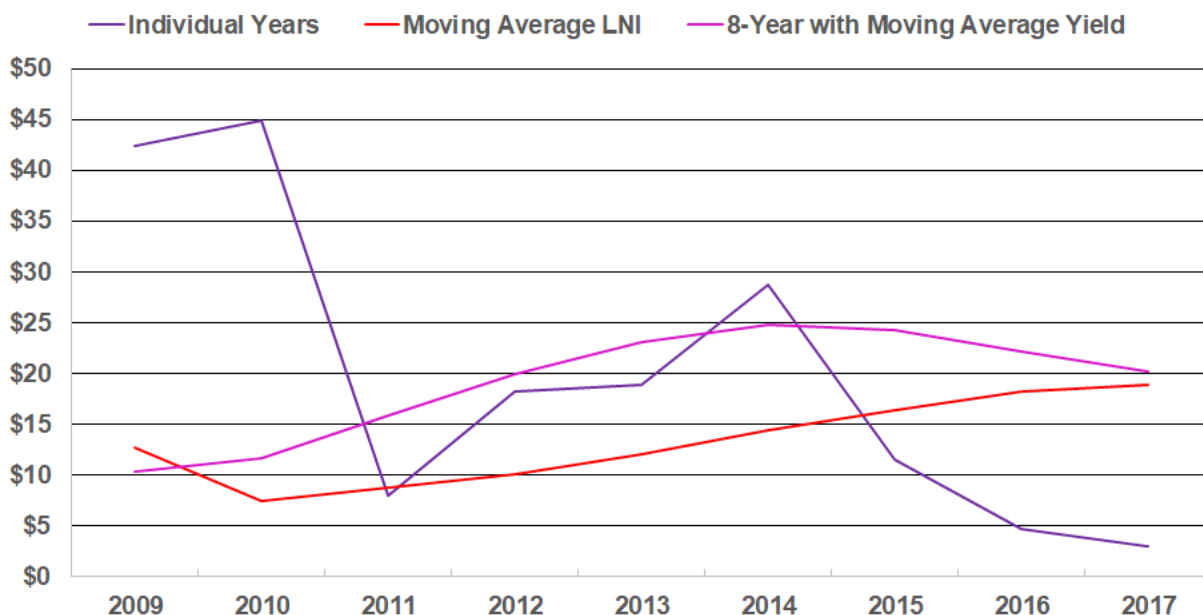


Figure 13. The eight-year moving average process for landlord (red) returns and the eight-year simple average with moving average yield (orange) for Lane county compared with individual years (purple).

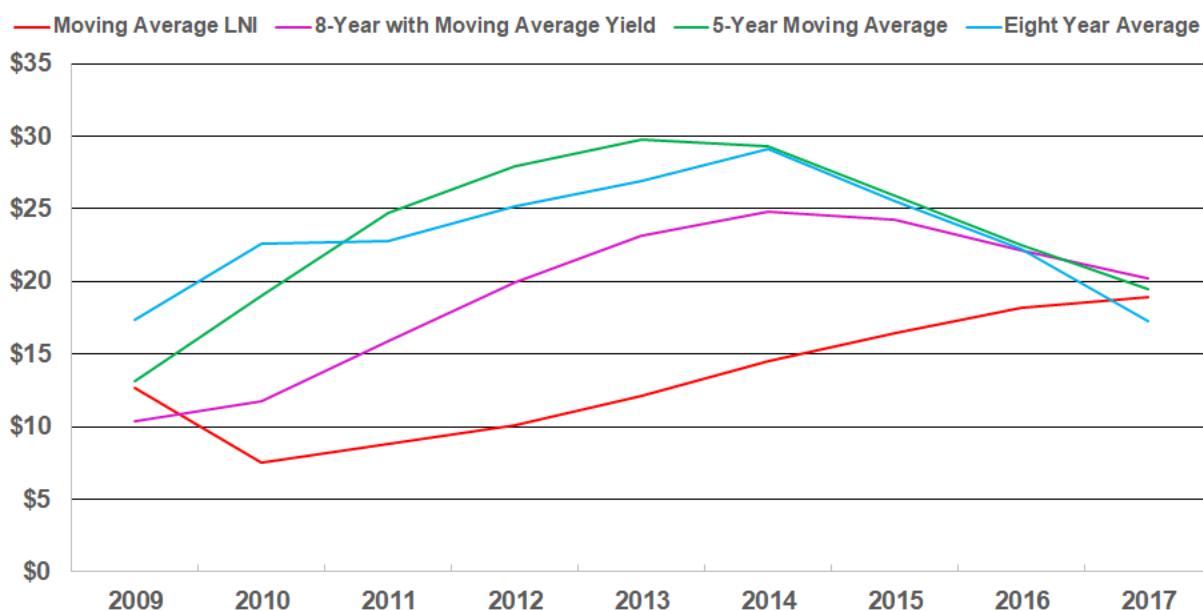


Figure 14. Comparison of the Current Method (red), the eight-year simple average (blue), the five-year moving average (green) and the 8-year simple average with moving average yield (pink) for Lane county.



Table 1. Summary Statistics for Landlord Net Income for Kansas Counties, 1999-2017

Variable	Minimum	Minimum County	Maximum	Maximum County
Average	\$7.09	Morton	\$119.59	Doniphan
Standard Deviation	\$10.47	Clark	\$64.63	Doniphan
Coefficient of Variation	46.0%	Saline	174.8%	Morton
Minimum LNI	-\$16.48	Morton	\$27.02	Ottawa
Maximum LNI	\$32.00	Stevens	\$238.68	Doniphan
Range	\$38.51	Hodgeman	\$220.16	Doniphan
Range/Average	145.3%	Barton	689.1%	Morton
Largest Yearly Increase	\$17.94	Clark	\$127.07	Nemaha
Largest Yearly Decrease	-\$96.71	Atchison	\$-13.40	Ellsworth



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