Methodologies and Data Sources Used in Determining the 2016 Calendar Year Landlord Net Rental Income for Pasture and Rangeland for the Agricultural Land Use-Values

The Department of Agricultural Economics, Kansas State University (KSU), in cooperation with the Division of Property Valuation (PVD), has developed the following procedures for determining the landlord's share of net rental income for pasture and rangeland in Kansas following the guidelines set forth in K.S.A. 79-1476. The statute dictates that pasture and rangeland are to be valued for property tax purposes based on the net rental income received by the landlord. The methodology and sources of data are outlined in this document.

K.S.A. 79-1476 requires that an 8-year average of landlord net returns be used by PVD in determining the agricultural land use-values. For the 2018 valuation year, the 8-year average is comprised of 2009 through 2016 calendar year data. KSU calculated landlord net returns for 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016, according to directives issued by PVD. Thus, the 2016 calendar year data were added to the data series, and PVD excluded one year of data to keep the 8-year average intact. The 2009-15 calendar year data are documented and explained in previous editions of this text. This text documents the methodologies and data sources used to calculate the 2016 calendar year net returns, which were combined with the prior year's data by PVD to yield the 8-year average. The main components of the pasture analysis explained in this text are soil mapping units, grazing productivity indices, rental rates, gross rental income, expenses, management fee, and landlord's net rental income.

The 2016 net rental returns have been calculated by soil mapping unit by United States Department of Agriculture National Agricultural Statistics Service (NASS) Crop Reporting District as directed by PVD. Returns are calculated for both native and tame pasture.

SOIL MAPPING UNITS AND GRAZING INDICES

Bill Roth, Property Valuation Division of the Kansas Department of Revenue, in cooperation with the Natural Resource Conservation Service (NRCS) developed the Grazing Index for each soil mapping unit (soil type) for both native and tame pasture. Each soil mapping unit has a productivity value associated with it. This value is a measure of the forage producing capacity of the soil. Many factors affect plant growth and forage production. Some of the factors considered are weather, soil characteristics (depth, texture, slope, fertility, moisture holding capacity), and plant growth and development.

The weighted average Grazing Productivity Index was calculated for each district using the Grazing Index and the pasture acreage by soil mapping unit. The weighted average Grazing Productivity Index was used to normalize (index) the Grazing Productivity Index by soil mapping unit. Thus, the soils of average productivity in the district should correspond with an indexed value of 1.0. Actual acreage by soil mapping unit by county was provided by the Division of Property Valuation.

RENTAL RATES

Cash rental rates are used to calculate the gross receipts that grassland will generate. Individual rental rates were used for each of the nine NASS Crop Reporting Districts. The cash rental rates for grassland are normally published each year in "Agricultural Land Values", an annual publication of NASS. This publication lists only one cash rent for all grassland; it does not provide separate cash rents for native and tame grass. In previous years, the same cash rental rate was used for native rangeland and tame pasture since the adjustments for productivity were already made with stocking rates; fertilizer costs were excluded for this reason. However, with the changes in the derivation of the grazing productivity index (previously stocking rate), separate cash rents were necessary in order to continue excluding fertilizer costs.

The Department of Agricultural Economics, Kansas State University, conducted a pasture size and cash rent survey of Kansas Livestock Association Members, County Appraisers, and County Agricultural Extension Agents during the summer of 1998. From the survey, separate average cash rents for native and tame grass were determined for the nine NASS reporting districts, and from these cash rents, the ratio of the tame to native cash rent was determined. Using the number of acres in native grass, tame grass, and total grass as provided by PVD, the cash rents ratios from the survey and the NASS published all grass cash rents, individual weighted average cash rents for native and tame grass were determined for all nine crop reporting districts. Cash rent ratios from the 1998 Pasture Survey were related back to the published NASS cash rents in order to preserve the use of the published data source. Results from this survey were used in the 1998 calendar year data. NASS conducted a survey during 1998, 2003, 2006, and 2010, the Pasture Leasing Arrangement Survey, and the results of those surveys were used in determining prior year cash rent ratios and separating cash rents into native and tame pasture rents. The Agricultural Land Use Survey Center (ALUSC) conducted the Pasture Leasing Arrangement Survey in 2015, and the most current survey research was used in determining the cash rent ratio and to separate cash rents in the 2016 calendar year data.

GROSS RENTAL INCOME

The gross rent per acre was calculated by multiplying the indexed productivity for each soil mapping unit by the 2016 district rental rate. This yields the indexed gross rental income in $/acre, which represents the rental value of the differing productivity levels for each soil mapping unit within the district. The gross rent was calculated individually for the native range and tame pasture soil mapping units.

EXPENSES

Three types of expenses were researched for the 2016 pasture and rangeland analysis. They were general maintenance expenditures, ownership costs associated with fences, and the costs of providing water to livestock. The procedures were the same for native and tame grasses and did not vary across soil mapping units. Fertilizer costs for tame or cool season grasses are not relevant given the separate cash rents for the grasses.

Maintenance Costs

The first cost studied was annual maintenance costs per acre. Joe Harner, Extension Agricultural Engineer, Department of Biological and Agricultural Engineering, Kansas State University, stated that annual maintenance charges for a pasture are estimated by agricultural engineers to be 2.5% of the initial cost of a fence. This figure includes fence maintenance, brush control, and burning costs. These are typical costs for a pasture, but they are difficult to gather and are highly variable. Specifically, the costs can be either extremely high or nearly non-existent. Little maintenance occurs in many pastures across the state because many landowners are hesitant to invest additional capital to improve pastures, or they will include these expenses as tenant responsibility as part of the lease agreement. Conversely, other landlords will choose to or are forced to spend significant amounts of money to repair fences, ponds, etc. Again, these types of costs vary considerably.

In previous years, the recommendation from Agricultural Engineering of 2.5% of the initial fence cost had been used as the maintenance cost. Results of subsequent pasture surveys suggested that maintenance costs were roughly closer to 6.5% of the initial fence cost. Thus, for the 2008-2011 calendar year net returns, 6.5% of the initial fence cost was used as the maintenance cost. The 2010 Pasture Lease Arrangement Survey included questions to specifically gather data on pasture maintenance costs and the landlord's participation in those costs. Therefore, for the 2012-13 calendar year net returns, the results from the 2010 Pasture Lease Arrangement Survey are used to calculate the landlord's share of the average pasture maintenance cost. For the 2014-16 calendar year net returns, the results from the 2015 Pasture Leasing Arrangement Survey were used to calculate the landlord's share of the average pasture maintenance cost. The landlord's share of pasture maintenance expense by district and grass type are:

	Native	Tame
NW-10	10.00%	0.00%
WC-20	8.57%	0.00%
SW-30	7.14%	0.00%
NC-40	10.20%	7.23%
C-50	13.17%	8.84%
SC-60	3.85%	8.84%
NE-70	22.40%	16.83%
EC-80	24.37%	5.56%
SE-90	17.37%	9.71%

Fence Ownership Costs

The second expense investigated was the annual cost of fence ownership. The annual ownership cost of a durable asset normally includes depreciation, interest, repairs, property taxes, and insurance (DIRTI five). For this study (Use Value Appraisal), property taxes, repairs, and insurance are handled elsewhere in the analysis. Thus, depreciation and interest costs comprise the ownership cost for the durable asset, the fence in this case. Therefore, these costs were calculated for fences on a per acre basis.

Fence costs on a per acre basis vary greatly, depending on the size of the pasture. A small

pasture has a large number of feet of fence per acre relative to a large pasture. For example, a 20 acre pasture has approximately 99.0 feet of fence/acre, while a 640 acre pasture has roughly 24.75 feet of fence per acre assuming that the landowner only has responsibility for 50% of the perimeter fences and 100% of any cross-fences. In short, the per-acre costs are greater for a small pasture relative to a larger pasture. The per-acre feet of fence also varies with the shape of the pasture. This is a problem when developing net rental amounts on a per acre basis. Thus, the 2015 Pasture Leasing Arrangement Survey was used to determine a representative pasture size and associated required feet of fence for each of the nine NASS crop reporting districts. The survey asked respondents about the typical pasture size and the feet of fence they have. From the results, the mode, or most frequently occurring, pasture size was selected for each district. Using only those surveys with the mode pasture size, the average feet of fence for that pasture size was determined. Subsequently, all other survey information from that district was excluded from the analysis; once a mode pasture size was established for a district, only the surveys with the corresponding pasture size from that district were analyzed.

The per-acre feet of fence was calculated for the representative pasture size by district as determined in the 2015 Pasture Leasing Arrangement Survey assuming that the landowner was responsible for 50% of all perimeter fences and 100% of any cross-fences. Once the feet of fence per acre was known, a cost per foot of fence was needed to calculate the fence cost per acre. The cost per foot of fence was calculated for the typical fence type of the typical pasture size for each district. The typical fence type per district was determined from the 2015 Pasture Leasing Arrangement Survey responses. Data for the mode pasture size by district was used to determine four general fence types using the mode wire type (4 or 5wires), mode post type (steel, treated, combination), mode post spacing, mode cross-fence use, and mode fence life. The cost per foot of fence was calculated for the four general fence types. They were:

- Type 1: 4 Wire Fence with Gate, 1/4 Mile Long
- Type 2: 4 Wire Fence with Gate, 1/2 Mile Long
- Type 3: 5 Wire Fence with Gate, 1/4 Mile Long
- Type 4: 5 Wire Fence with Gate, 1/2 Mile Long

The fence types represent fences with gates and differing wire types and lengths of fence (1/4 and 1/2 mile). The purpose of four fence types was to determine a cost per foot for fences with varying characteristics. Type 1 and 3 fences are used for 79 acre pastures and smaller. Type 2 and 4 fences are used for pastures ranging from 80 to 320 acres.

Twenty-four suppliers of fencing materials across the state were contacted in the spring of 2015 to determine the costs for posts and barbed wire in the 2015 calendar year. Labor charges for constructing fences and setting corner posts were determined from the 2015 Pasture Leasing Arrangement Survey; results were compared with those published in the 2013 *Kansas Custom Rates*, a former publication of NASS. These expenses are detailed in the appendix.

The cost per acre of a fence was then derived using the following formula:

Feet of Fence per Acre * Cost per Foot of Fence = Total Fence Cost per Acre

These costs are in 2014 dollars and were used in the 2014 calculation. These costs are indexed by the Producer Price Index in off-survey years. The annual ownership cost of the fence, which includes depreciation and interest, was then determined. PVD directed KSU to utilize only 50% of these amortized fence ownership costs.

Livestock Watering Costs

In previous years, PVD directed Kansas State University to include $1.00 per acre for the cost of providing water to livestock. This includes items such as ponds, stock tanks, wells, windmills, spring developments, and hauling water. KSU conducted research related to many of these topics; however, the costs are highly variable depending on weather, location, pasture size, government cost-sharing, etc. Watering costs were re-examined and requested in the 2015 Pasture Leasing Arrangement Survey conducted by the Agricultural Land Use Survey Center of KSU. The survey data suggested that watering costs are roughly $0.60 per acre. Thus, $0.60 per acre was used as the cost of providing water to livestock on all pasture.

MANAGEMENT FEE

A management fee is calculated to account for the costs associated with business and managerial decisions. The fee is 10% of the gross rent per acre, which is consistent with the current rates charged by farm management and consulting firms in Kansas. The 10% fee was verified by ten firms and is supported by Kansas State University management fee surveys conducted in 2013, 2009, 2005, 2001, 1998, 1994, and a 1990 survey that investigated farm management practices and fees in Kansas.

LANDLORD NET RENTAL INCOME

The landlord's share of net rental income was determined by combining the previously explained factors into a system of equations. PVD directed that the 2016 calendar year landlord net rental income for pasture and grassland be calculated by soil mapping unit. The grazing productivity index for each soil mapping unit was indexed based on the weighted average productivity rate for the district. The Indexed Landlord Gross Rental Income by soil mapping unit was determined by multiplying the district average cash rent by the indexed productivity rates. The maintenance costs, fence ownership costs, and livestock watering costs, as well as the 10% Management Fee, were then subtracted from the Indexed Gross Rental Income to determine the 2016 Landlord Net Rental Income. This was done for both native and tame grasses. Net returns for tame grass were not generated for Districts NW-10, WC-20, and SW-30, since virtually no tame acres exist in these districts.

APPENDIX:

Included in the appendix are the 2016 calculations for native and tame grass. The tables illustrate the procedures and data sources for each factor used to calculate the landlord net returns for 2016. Again, these data represent only one year of the statutorily required 8-year average. Specifically, the following items are included in this appendix:

- NASS' Crop Reporting Districts Map
- 2016 Land Analysis for Native and Tame Grass
- 2016 Cash Rent Data
- Fence Construction Cost Analysis
- Fence Cost per Acre by District Pasture Size
- Example of the Grazing Land Index