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In the wake of rapid changes in Kansas agricultural land values, many people are also wondering how rental rates for cropland have been affected. Historically, the irrigated cropland ratio of cash rent to land value, i.e., rent-to-value ratio, has been in the range of 6 to 7 percent. This ratio indicates the annual return, before real estate taxes, that landowners can expect on their capital investment from renting the land out, excluding capital gains. If that relationship still holds, then a state-level estimate by the Kansas office of the National Agricultural Statistics Service (NASS) for the value of irrigated cropland in 2013 of $3,000/acre would imply cash rental rates ranging from approximately $180 to $210/acre.[1] This range leaves a large amount of negotiating room for landowners and tenants. Furthermore, which party (landowner or producer) owns irrigation-related equipment, e.g., pump and gearhead, motor, center pivot, will impact what the cash rental rate will be. An important consideration in recent years has been the rapid increase in ag land values, which may be due in part to "non-ag" reasons. In this situation, the historical rent-to-value ratio may not be appropriate, prompting us to apply an alternative method of estimating rental rates.[2]

Rather than targeting a particular rate of return on irrigated cropland, which may or may not reflect the productivity of the land, production technology changes, or current crop prices, we estimate projected cash rents for the 2015 crop year using a method of calculating landowner revenue from an equitable crop share arrangement. Crop share arrangements have been for many years and continue to be the primary way of leasing land in Kansas, so most landowners and producers are familiar with the concept.

The first step in the cash rent estimation process is to determine equitable crop share percentages for the landowner and the operator. The decision aid used to guide these calculations is the *KSU-Lease.xls* Excel spreadsheet available at the AgManager.info website: (http://www.agmanager.info/farmmgt/land/lease). The basic premise of the approach in *KSU-*

[1] Historical Kansas land values available at: http://www.ksre.ksu.edu/bookstore/pubs/mf1100.pdf
[2] Rent-to-value ratios in the past two years have been 4% to 5%, as the price of land has increased at a faster rate than cash rents.

Lease is that a lease is considered to be equitable if the income from the lease is shared proportionally to the value of the inputs (costs) contributed by both parties.[3]

The *KSU-Lease* spreadsheet requires input of production cost data for a given crop mix, expected yields, and expected commodity prices. Costs of production and farming practices were based on information in the Farm Management guides projected crop budgets published annually (http://www.agmanager.info/farmmgt/fmg/irrigated). The crop enterprise mix for each of four regions (NW, SW, NC, and SC) of the state were determined using average acres estimates from 2010-2012 from the Kansas Farm Management Association (KFMA) database (http://www.agmanager.info/kfma). The crop mix was limited to wheat, corn, soybeans, and grain sorghum. Expected yields for these crops were estimated from the KFMA database using a 20-year trend-adjusted yield. Expected commodity prices were based on the average daily prices during the month of November 2014 for the 2015-2017 harvest futures contracts (July for wheat, December for corn, and November for soybeans) and were. To get at expected cash prices for each of the regions, 3-year historical basis levels (2012-2014) were added to the average futures prices.

Other inputs required in the *KSU-Lease* spreadsheet are seed, fertilizer, chemical, land, machinery, irrigation equipment, and pumping costs. Prices of seed, fertilizer, and chemicals (herbicide, insecticide, and fungicide) were based on current costs. Machinery costs were based on region-specific projected custom rates for 2014 multiplied by typical farming operations in the region. Custom rates were multiplied by 120% because producer-level costs are typically higher than custom rates. Land cost in the *KSU-Lease* spreadsheet was set at a level that resulted in an economic profit equal to $0 per tillable acre. This is consistent with the economic theory that competitive industries, such as commodity farming, will have average economic profits close to zero in the long run. This happens because if profits are positive across most farmers, they will use those profits to bid up the prices of fixed assets like land. Likewise, if profits are negative there will be economic pressures for land values (and rents) to decline.

[3] For a further discussion of the principles behind how leases are determined see publications NCFMEC-01 and NCFMEC-02 also available at AgManager.info

Given the completed crop budgets in *KSU-Lease* for each of the four regions where irrigated acres are common, the next step was to identify the party who provided each of the contributions and calculate the equitable crop share percentages for the landowner and the operator. The landowner's equitable share was calculated based on a net share lease, i.e., no inputs being shared between the landowner and operator, with an adjustment to account for 100% of government payments going to the operator.[4]

The expected commodity prices, crop acreage mix, historic yields, and landowner's crop share percentage averaged to the regional level are presented in table 1. The estimated crop share percentages to the landowner, when the tenant owns the pivot, range from 14.1% in the Southwest region of the state to 34.4% in the North Central region. The range of crop share percentages to the landowner, when they own the pivot, is from 21.5% in the Southwest to 41.2% in the North Central region.[5] The difference in crop share splits across the regions reflects the relative productivity, costs, and revenue potential of the farmland.

The second step in the cash rent estimation process was to use the equitable crop share percentages determined in step one to calculate the expected return to the landowner, given price and yield expectations for the 2015 crop year for each county.[6] To do this, the estimated crop share split was applied to 8-year historical county-level yields (2004-2011), as reported by USDA-NASS, and the expected commodity price forecasts, shown in table 1, to determine an estimate of expected landowner crop share revenue at the county level. The crop rotation (i.e. crop mix) was determined using county level data from the 2002 and 2007 Census of Agriculture. Counties with less than 5,000 acres of irrigated farmland, according to the Census, were excluded from the estimates.

[4] The completed versions of the four *KSU-Lease* files include numerous details that are not presented here to save space. However, the files are available from the authors upon request.
[5] These values will deviate from what might be "typical" in a region for two primary reasons. First, these values reflect what is equitable based on current land values and farming practices. Second, these values have been adjusted to account for the operator receiving 100% of government payments.
[6] For counties in the West Central and Central regions, the average crop share percentage for the corresponding northern and southern regions was used.

Table 1. Prices, Acreages, and Crop Share Percentages Used to Estimate Cash Rental Rates

				Landowner's Crop Share	
Region	Price, $/bu	Crop Enterprise Mix, % of acres*	20-Year Adjusted Trend Yields*	Tenant-Owned Pivot	Landowner-Owned Pivot
Northwest				21.6%	27.2%
Wheat	5.70	76.4	57.0		
Corn	4.08	14.2	199.0		
Soybeans	9.18	8.8	51.0		
Grain Sorghum	3.90	0.5	93.0		
Southwest				14.1%	21.5%
Wheat	5.83	42.5	52.0		
Corn	4.36	16.9	177.0		
Soybeans	9.19	27.7	57.0		
Grain Sorghum	3.95	12.9	100.0		
North Central				34.4%	41.2%
Wheat	5.80	56.3	56.0		
Corn	3.86	40.1	177.0		
Soybeans	9.38	1.9	51.0		
Grain Sorghum	3.92	1.6	110.0		
South Central				16.8%	23.6%
Wheat	5.88	54.0	60.0		
Corn	4.07	32.6	177.0		
Soybeans	9.47	10.6	51.0		
Grain Sorghum	3.95	2.8	101.0		

* Crop enterprise mix and trend yields presented here are averaged across the KFMA region. However, county-level values for both of these variables were used to calculate the county-level rental rates.

The 2015 county-level estimates of irrigated cropland cash rental rates are given in table 2. The first column of rental rates contains the survey-based values reported by USDA-NASS for 2014 (2014 NASS column). They are obtained via a survey of farmers that asks for the average rent paid on the irrigated farmland they lease. The next two columns present the KSU estimated irrigated rental rates for 2015 under two different scenarios: (1) the tenant owns the center pivot, (2) the landowner owns the center pivot. On average across the state, the cash rental rate is estimated to be $32/ac higher if the landowner owns the pivot.[7] A comparison of the rental rates from USDA-NASS and those estimated for the 2015 crop year using the equitable crop share approach (KSU Rental Rate column) reveals the NASS estimates are similar for most counties. However, there is no consistency across regions as to whether the NASS estimate is closer to the KSU estimate for tenant ownership or landowner ownership of the pivot.

[7] The other assumptions for irrigation equipment are that the tenant owns the motor and that the landowner owns the well, pump, and gearhead.

Why would rental rates collected via survey be different than risk-adjusted crop share estimates? The cost of production and commodity price information used in the KSU crop share lease method reflects current available information about what returns to irrigated farming would be under prices projected for the next 3-5 years. Therefore, if a contract between a landowner and tenant were being negotiated today for the next 3-5 years, these rates should be very close to negotiated rates. A potential problem with the NASS survey values is that they do not reveal the year in which the rental rate being reported was negotiated. If a contract has been in place for several years, with no change in the rental rate, then the rate could be higher or lower than a current contract reflecting differences in crop prices.

The KSU estimates for the 2014 crop year (publication available at http://www.agmanager.info/farmmgt/land/lease) were significantly higher than those estimated for the 2015 crop year. The biggest difference in the calculations between these two estimates is the significant drop in futures prices between November 2014 and November 2015. The volatility of crop prices translates back to volatility in ability to pay for leased land and may affect the length of leases landowners and tenants are willing to negotiate. More volatile prices will give the incentive to negotiate rental rates more often to avoid situations where farmers are overpaying or landowners are receiving less than market value for their cropland.

It is important to recognize that the two methods of estimating rental rates reflect two very different things. The USDA-NASS survey value reflects what people are paying (receiving) on average across all leases without considering when the leases were negotiated, landowner-operator relationships, etc. On the other hand, the KSU estimate value reflects what might be expected for a newly negotiated rent between two parties negotiating an equitable lease today. Thus, the KSU-estimated values for 2015 should not be compared with the NASS-survey values for 2014 as an implication of what we are expecting for year-to-year changes. As stated above, the two methods reflect two different things and thus they should not be viewed as 2014 versus 2015 rents (i.e., the KSU method for 2014 was significantly higher than the KASS surveyed values).

Table 2. Estimated Cash Rental Rates for Irrigated Cropland ($/ac)

Region[1]	County	2014 KASS Survey[2]	2015 KSU-Tenant Owns Pivot[3]	2015 KSU-Landowner Owns Pivot[3]
NW	Cheyenne	187.00	112.00	142.00
	Decatur^	100.00	106.00	133.00
	Graham	111.00	90.00	113.00
	Norton^	100.00	111.00	139.00
	Rawlins	157.00	107.00	135.00
	Sheridan	173.00	128.00	161.00
	Sherman	138.00	123.00	155.00
	Thomas	169.00	125.00	157.00
	Average:	**141.88**	**112.75**	**141.88**
WC	Gove	126.00	78.00	107.00
	Greeley^	106.00	88.00	120.00
	Lane^	106.00	60.00	83.00
	Logan^	106.00	84.00	114.00
	Ness^	106.00	--	--
	Scott	70.50	84.00	114.00
	Trego^	106.00	--	--
	Wallace^	106.00	95.00	129.00
	Wichita^	106.00	78.00	106.00
	Average:	**104.28**	**81.00**	**110.43**
SW	Clark^	133.00	--	--
	Finney^	133.00	71.00	109.00
	Ford	126.00	73.00	112.00
	Grant	79.00	69.00	105.00
	Gray	110.00	76.00	116.00
	Hamilton	109.00	51.00	77.00
	Haskell	94.50	79.00	120.00
	Hodgeman^	133.00	55.00	83.00
	Kearny	122.00	79.00	121.00
	Meade	156.00	89.00	137.00
	Morton^	133.00	58.00	89.00
	Seward	131.00	79.00	120.00
	Stanton	75.00	73.00	112.00
	Stevens	87.00	79.00	121.00
	Average:	**115.82**	**71.62**	**109.38**
NC	Clay	127.00	171.00	205.00
	Cloud^	155.00	167.00	200.00
	Jewell^	155.00	174.00	209.00
	Mitchell	135.00	156.00	187.00
	Osborne^	155.00	146.00	176.00
	Ottawa^	155.00	--	--
	Phillips^	155.00	175.00	210.00
	Republic	182.00	182.00	218.00
	Rooks^	155.00	--	--
	Smith^	155.00	--	--
	Washington	153.00	166.00	199.00
	Average:	**152.91**	**167.13**	**200.50**
C	Barton	109.00	126.00	159.00
	Dickinson^	89.50	97.00	124.00
	Ellis^	89.50	--	--
	Ellsworth^	89.50	--	--
	Lincoln^	89.50	--	--
	Marion^	89.50	--	--
	McPherson	119.00	120.00	153.00
	Rice^	89.50	121.00	153.00
	Rush^	89.50	107.00	135.00
	Russell^	89.50	--	--
	Saline	80.00	--	--
	Average:	**93.09**	**114.20**	**144.80**
SC	Barber^	142.00	74.00	104.00
	Comanche^	142.00	--	--
	Edwards	137.00	89.00	126.00
	Harper^	142.00	--	--
	Harvey	140.00	75.00	105.00
	Kingman	79.00	69.00	97.00
	Kiowa	162.00	81.00	114.00
	Pawnee^	142.00	77.00	108.00
	Pratt	121.00	88.00	124.00
	Reno	115.00	73.00	103.00
	Sedgwick^	142.00	74.00	105.00
	Stafford	107.00	84.00	118.00
	Sumner^	142.00	68.00	96.00
	Average:	**131.77**	**77.45**	**109.09**

[1] Region refers to the Kansas Ag Statistics crop reporting districts (CRD), where NW=Northwest, WC=West Central, SW=Southwest, NC=North Central, C=Central, and SC= South Central.

[2] KASS rental rates available at http://www.nass.usda.gov/Statistics_by_State/Kansas/index.asp (Values were reported for 32 of 66 counties. The other 34 are multi-county averages, indicated with a "^".)

[3] KSU Rental Rate is based on using *KSU-Lease* and equitable crop share approach. *KSU-Lease.xls* is available at http://www.agmanager.info/farmmgt/land/lease/default.asp