Kevin Dhuyvetter and Terry Kastens

Landowner vs. Tenant: Why Are Land Rents So High?

Kansas land values represent over three-fourths of the total agricultural assets in the state and, on an annual basis, land costs account for approximately a fourth of production costs of typical nonirrigated crops. Thus, it is easy to understand why talk of land values and rents is of great interest to so many people. It is also easy to understand why people become concerned if land values and rents are perceived to increase to levels that are not economically justified. From 1982-2001, nonirrigated crop land in Kansas earned a 5.9% return from cash rents. Over this time period, there has been no upward trend in the rent-to-value ratio, suggesting that, on average, there is no overwhelming evidence that landowners have been able to exert market power and increase their returns at the expense of tenants. Many factors affect crop land rental rates (e.g., government policy, taxation, tradition, technology), thus understanding why rental rates and terms vary is a complex issue. The results of this analysis indicate that above-average producers can economically justify bidding up rents even during times when average producers might be losing money. That is, differences in management abilities can explain why paying "high" land rents (either cash or crop share) may be unprofitable for some producers but be the result of rational business decisions by other producers. Thus, the answer to the question of why are land rents so high may simply be "because there is competition in agriculture and the market is working."

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We've all heard stories about land rents rising and reaching levels that are "way too high" to make any money farming. Regardless of whether or not these stories are fact or simply perception, questions that often follow are, What is causing this and who is to blame? Are landowners greedy and exerting market power to drive land rents up? After all, there is only so much land available! Or, are farmers foolishly bidding up rents and cutting their own throats in the process? After all, nobody is "forcing" them to pay higher rents! Unfortunately, the answers are not simple. The objective of this paper is to provide some background information to increase our understanding of the agricultural land market.

Land value versus land cost

Information about land values and land rents typically generates considerable interest in Kansas, and for good reason. The total value of land and buildings in Kansas in 1999 was estimated at over $37.4 billion dollars, split about equally between landlords ($18.5) and operators ($18.9) (USDA, 1999). In 1988, the total value of land and buildings in Kansas was considerably lower, at $19.7 billion ($9.4 for landlords and $10.3 for operators) (USDA, 1988). However, in both 1999 and 1988, land represented slightly over three-fourths of the total agricultural assets in Kansas with machinery and equipment following at a distant second (figure 1). From 1988 to 1999 total agricultural assets in Kansas increased 87%, with the land and buildings portion increasing 89% – an annual growth rate of 5.99% for land and building asset values. Thus, it is quite apparent why issues related to land values are of interest to so many people in Kansas.

From an agricultural producer's perspective, land values are relevant, however, producers are often more interested in the annual cost associated with using land in the production process. The *annual cost* associated with land is not the same as the overall *value of land*, but the two are closely related. Figure 2 shows the average land value and cash rent for the last 20 years for nonirrigated crop land in Kansas. It is easy to see the strong positive relationship between land values and cash rents. While land values and cash rents do not move together perfectly from year to year, the relationship between the two is quite evident.

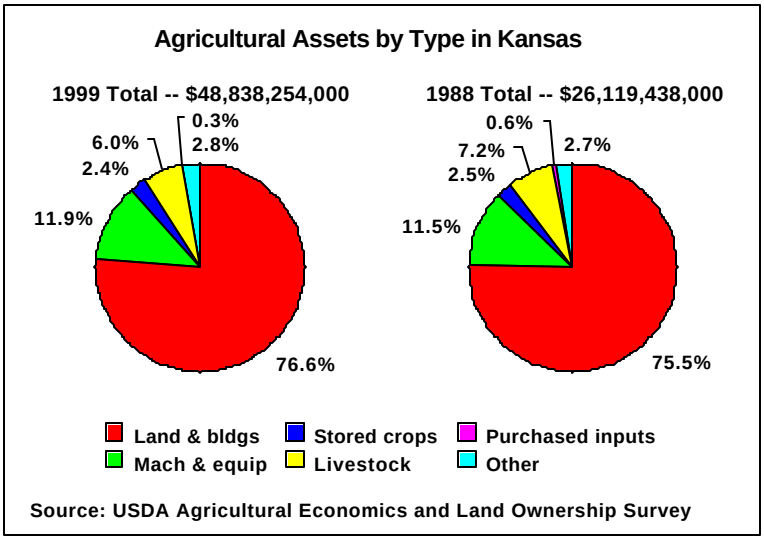

Figure 1

Because land values and cash rents tend to move together as shown in figure 2, a ratio of the two should be relatively constant. Figure 3 shows the rent-to-value ratio (cash rent divided by land value) for nonirrigated crop land for the last 20 years in Kansas. The average rent-to-value ratio has been 5.9% over this time period, ranging from a low of 4.7% in 1982 to a high of 6.9% in 1987. Note that the lowest (highest) rent-to-value ratio coincided with the highest (lowest) land value, indicating that cash rents are somewhat less responsive than land values. That is, cash rents don't go up as high nor down as low as might be expected based solely on land values. Over this 20-year time period, there has been no discernable trend in the rent-to-value ratio suggesting that landowners are extracting higher (lower) rents today than they did in the past. The rent-to-value ratio means that the *annual cost* associated with nonirrigated land has been equal to 5.9% of the value of land on average. This figure is an important benchmark for owner-operators, landlords, tenants, and potential land investors because historical averages are often our best estimate of future values.

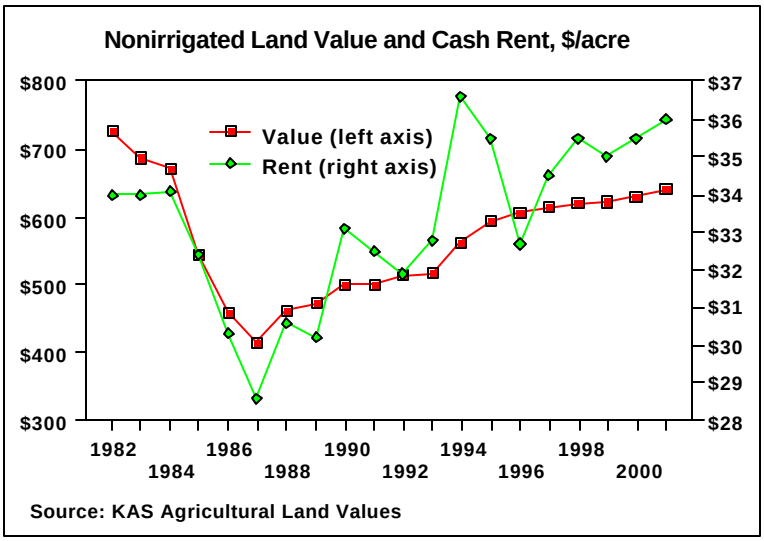

Figure 2

In figure 1 we saw that land comprised over three-fourths of the total assets in Kansas agriculture, but in figure 3 it is shown that the annual cost of using land has been approximately six percent of its total value. Thus, a relevant question to answer is, How important is annual land cost relative to other production costs? Table 1 shows a breakdown of costs, averaged across typical nonirrigated crops, by major cost category for the different regions of Kansas from the 2001 Farm Management Guides (K-State projected crop budgets). Based on these regional average budgets, land costs represent between 22.3 and 26.2 percent of the total annual production costs. Total machinery costs (i.e., depreciation, interest, repairs, fuel and oil) are estimated to represent between 21.2 and 24.7 percent of the total annual production. While the land and machinery cost portions of total costs are similar across the state, there are some slight differences. For example, in northeast and western Kansas the land represents a slightly larger proportion of total costs

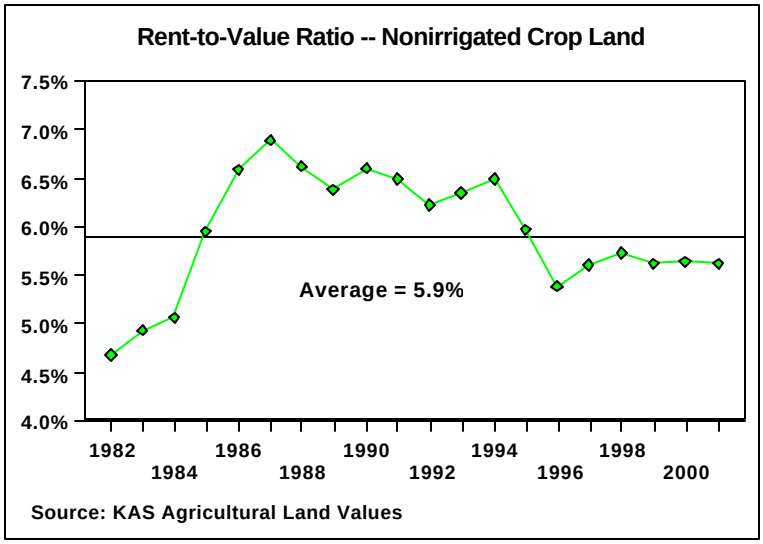

Figure 3

than does machinery, whereas, in south central Kansas it is the other way around. In the other regions land and machinery represent similar proportions of total costs.

Table 1. Breakdown of Total Costs by Cost Category (nonirrigated crops in Kansas).[a]

	Northeast	Southeast	North Central	South Central	West
			Percent of Total		
Seed	9.4	8.5	11.2	8.4	7.2
Herbicide/insecticide[b]	7.8	9.7	9.6	9.8	17.1
Fertilizer[b]	10.2	13.6	12.4	14.4	10.9
Machinery	24.3	23.9	23.0	24.7	21.2
Other	13.4	13.2	12.7	13.6	11.7
Labor	8.7	6.4	8.8	6.3	5.9
Land	26.2	24.6	22.3	22.7	26.1
Total	100.0	100.0	100.0	100.0	100.0

[a] source: KSU 2001 Farm Management Guides

[b] ingredient cost only; application charge is included in machinery and labor categories

The information presented in figures 1-3 and table 1 are relevant as we consider how land rents are ultimately determined. Thus, the next step is to understand how land rents (crop share or cash rent) are related to this information.

Determining Crop Share and Cash Rental Rates

Requests for information pertaining to crop share and cash rental rates are received more often than any other topic by many farm management economists. These requests come from both landowners and tenants and range from wanting to know what a "fair" rental rate is to who should pay for certain inputs. It is important for landowners and tenants to recognize that economists do not set rental rates or the terms of their lease arrangements. Rather, it is them acting as supply (landowner) and demand (tenant) that determines market rates. It is the negotiation, or lack of it, among market participants that ultimately determines rates and lease terms within a region. However, although economists may not set rates explicitly, they can provide insight and guidance as to what might be expected given certain assumptions. But, in order to do that, certain economic principles must be relied upon because without them the answer is simply "whatever somebody is willing and able to pay."

Typically, landowners and tenants claim to want a crop share or cash lease arrangement that is "fair" and equitable to both parties. The term "fair" is extremely subjective and thus difficult to define, so instead, focus should be on determining what is equitable. Here, the definition of an equitable lease is one in which all parties are compensated in proportion to their contributions to the production process. In words, this means that if one party contributes 25 percent of the total inputs, then we would expect he/she should receive 25 percent of the returns in the form of bushels, government payments, or direct payments (i.e.,

cash rent). The economic principle underlying the contribution-based equitable rent concept is that, in the absence of information to the contrary, landowners and tenants should acquire approximately the same rate of return on their investment (their annual costs in this case), at least on average. This contributions-based approach is generally well understood and accepted by landowners and tenants and is used extensively in Kansas to provide guidance to them as they negotiate specific rates and terms of lease arrangements.

This paper only briefly addresses some of the points to consider when using the contributions-based approach to determine *crop share* or *cash* rental rates, for a more detailed discussion of these topics see Dhuyvetter, Kastens, and Outlaw (1999a, 1999b); and Langemeier (1997a, 1997b). Because the concept of an equitable lease is to share income in the same proportion as the contribution of inputs, the first step is to identify all inputs required in the production process. The next step is to identify who is responsible for each of the inputs (i.e., landowner, tenant, or shared between them). Once these two steps have been accomplished, the percentage contribution of the landowner and the tenant can be mathematically determined. Determining equitable *crop share* percentages using this approach is based entirely on contributions (i.e., costs) and thus income information (e.g., yield, price, government payments) is not required. However, estimates of such income variables are required to determine what comparable *cash* rent rates might be. In addition to the "going" *cash* rent in a region (i.e., the market rate), the following methods are typically used for determining a starting point for *cash* rent negotiation between the landowner and tenant: (1) landowner's cost, (2) amount tenant can afford to pay, and (3) crop share adjusted for risk.

Landowner's cost refers to the opportunity cost of land investment, less expected capital gains, plus real estate tax. The idea is that a landowner expects some net rate of return (capital gains plus rent less real estate taxes = opportunity cost) on his/her investment otherwise the land would be sold and the money invested elsewhere. This net expected rate of return can be approximated by the historical average rent-to-value ratio (i.e., the 5.9% value shown in figure 3). The cash rent would be calculated by multiplying the rent-to-value ratio by the market value of the land. The "amount a tenant can afford to pay" method of establishing cash rents hypothesizes that the tenant receives all income and pays all operating expenses and whatever is left is available for cash rent to the landowner. Finally, because many Kansas landowners and tenants are familiar with crop share arrangements (probably because crop share arrangements have been around for much longer than cash rental arrangements), using a crop share approach to determine a cash rental rate is practical and quite common. This approach determines the cash equivalent amount of an equitable crop share arrangement and then possibly makes a risk adjustment to that value. The reason for making the risk adjustment is that with cash rent all of the production and price risk falls on the producer; whereas, this risk is shared between the producer and the landowner with a crop share lease. Risk adjustments are consistent with the economic principle that riskier investments "should" have higher returns.

Equitable crop share and cash rents for North Central Kansas – AVERAGE farmer

A starting point for determining crop share and cash rental rates is to consider what they would be for an "average producer" within a region. While no individual producer may exactly fit the definition of "average," it is often a good starting point in the absence of better information. For this paper, an average,

or representative farm for North Central Kansas is used as an example. However, the same principles and methods could be applied to a farm in any region. Crop mix is based on the average acres of nonirrigated corn, wheat, soybeans, and milo reported for members of the North Central Kansas Farm Management Association from 1999-2001. Costs and yields are based on K-State Farm Management Guides crop budgets (Lubben and Staggenborg; 2001a, 2001b, 2001c, 2001d). The Excel spreadsheet *KSU-Lease* was used to develop budgets and determine the corresponding equitable crop share percentages and cash rents. This spreadsheet and an accompanying paper are available online at www.agecon.ksu.edu/kdhuyvetter. Table 2 contains the crop budgets for each of the crops as well as the total and a per acre average for the farm. Based on the assumptions used, the average return over all costs (i.e., profit) is $0.31 per acre. Keep in mind that expected economic profit (after all costs have been included) is zero, on average, in a competitive industry. Zero economic profit implies that an investor will acquire an annual rate of return comparable to other similar-risk investments.

Once all contributions have been identified (i.e., the crop budgets have been developed), the next step is to identify who is responsible for each input. In the *KSU-Lease* spreadsheet this can be done one of two ways – (1) input contributions can be assigned in a fixed, predetermined percentage to each party (e.g., land is 100% the landowner's, machinery is 100% the tenant's, input X is shared 50/50), or (2) an input can be shared equitably (i.e., in the same proportion as the crop) which means it will be determined mathematically based on known contributions of other inputs. It is generally recommended that yield-increasing inputs such as fertilizer and irrigation pumping are shared in the same proportion as income (method 2), as this provides the economic signals to both parties for optimal input use. Other than for this reason, there is little economic justification that dictates that certain inputs should or should not be shared, or in what percentage they should be shared. Rather, what is important is that each party is compensated accordingly for what he/she contributes.

For the representative North Central Kansas farm used in this example, it was assumed that fertilizer (including lime), herbicides, insecticides, drying costs and all chemical application charges are shared equitably (i.e., in the same percentage as income). The land contribution is assigned to 100% the landowner and all other expenses (e.g., seed, machinery, labor) are assigned 100% to the tenant. Given the costs identified in table 2, along with these allocations, the equitable crop share split works out to be 66.6% for the tenant and 33.4% for the landowner. This means that the equitable crop share arrangement is 2/3 (tenant) – 1/3 (landowner), with income from crop sales and government payments, as well as costs of fertilizer, herbicides, insecticides, grain drying, and chemical applications being split in these proportions.[1]

[1] It is important to recognize that the fertilizer, herbicide, insecticide, drying costs, and application charges being shared 2/3 (tenant) and 1/3 (landowner) was not predetermined. Rather, this percentage was determined mathematically given all other input assumptions. In North Central Kansas, farmers often share those cost items we assumed in the KSU-Lease spreadsheet example. More importantly, area farmers sharing these input costs often operate with a 2/3 – 1/3 arrangement. This observation suggests that the average budgets used in this analysis are fairly representative of the region and also that current lease arrangements between landowners and tenants are, on average, equitable.

Table 2. Projected Crop Budgets for North Central Kansas.[a]

Crop/System	Corn	Soybeans	Wheat	Milo	Farm Total	Average Per Acre
Planted acres of each crop	102.0	188.3	452.3	232.7	975.3	---
INCOME PER ACRE						
A. Yield per acre	95.0	30.0	50.0	77.0	---	---
B. Price per unit	$2.05	$5.00	$2.75	$1.85	---	---
C. Net government payments	$25.00	$25.00	$25.00	$25.00	$24,383	$25.00
D. Indemnity payments	$0.00	$0.00	$0.00	$0.00	$0	$0.00
E. Miscellaneous income	$0.00	$0.00	$0.00	$0.00	$0	$0.00
F. Returns/acre	$219.75	$175.00	$162.50	$167.07	$167,747	$171.99
COSTS PER ACRE						
1. Seed	$39.60	$33.60	$9.60	$10.16	$17,073	$17.51
2. Herbicide	30.98	19.19	5.34	25.64	15,155	15.54
3. Insecticide / Fungicide	0.00	0.00	0.00	0.00	0	0.00
4. Fertilizer and Lime	28.36	10.46	26.34	22.84	22,091	22.65
5. Crop Consulting	0.00	0.00	0.00	0.00	0	0.00
6. Crop Insurance	0.00	0.00	0.00	0.00	0	0.00
7. Drying	12.35	0.00	0.00	10.01	3,589	3.68
8. Miscellaneous	6.25	6.25	6.25	6.25	6,096	6.25
9. Machinery Expense	61.53	44.37	43.56	54.78	47,079	48.27
10. Non-machinery Labor	12.50	12.50	12.50	12.50	12,192	12.50
11. Irrigation	0.00	0.00	0.00	0.00	0	0.00
12. Land Charge / Rent	40.38	40.38	40.38	40.38	39,384	40.38
G. SUB TOTAL	$231.95	$166.75	$143.97	$182.55	$162,659	$166.77
13. Interest on Nonland Costs	7.17	5.05	4.14	5.29	4,787	4.91
H. TOTAL COSTS	$239.11	$171.80	$148.11	$187.84	$167,446	$171.68
I. RETURNS OVER COSTS	($19.36)	$3.20	$14.39	($20.78)	$301	$0.31

[a] generated using *KSU-Lease* Excel spreadsheet

Tables 3 and 4 show the costs and returns based on the equitable 2/3 – 1/3 crop share split for the tenant and landowner, respectively. It can be seen that the return over total costs (i.e., profit) of $301 ($0.31 per acre) from table 2 is split proportionately between the landowner and tenant. This is of course the intent of crop share arrangements – variability in profits and losses from year to year are shared between the landowner and the tenant. Table 5 shows cash rents that are comparable to the equitable crop share. In this example, a cash rent of $40 per acre would be similar to a 2/3 – 1/3 crop share arrangement. Therefore, from strictly an expected returns standpoint, both the landowner and the tenant should be indifferent between the two. The information presented in tables 2-5 is what might be expected for an average producer in North Central Kansas. Based on this example, the producer would be compensated for his/her labor and investment in machinery and the landowner would receive a 6% return to his/her land

investment (plus any capital gains that might occur). Note that the 6% return to the landowner is not typically his/her total return. That is, expected capital gains of 3-4% push the total landowner return to around 9-10%. Expected capital gains are not included in the rental arrangement because they are irrelevant to the process.

Table 3. Projected Returns for AVERAGE North Central Kansas Tenant.[a]

Equitable share	66.6%	66.6%	66.6%	66.6%		
Crop/System	Corn	Soybeans	Wheat	Milo	Farm Total	Average Per Acre
Planted acres of each crop	102.0	188.3	452.3	232.7	975.3	—
INCOME PER ACRE						
A. Yield per acre	63.3	20.0	33.3	51.3	---	---
B. Price per unit	$2.05	$5.00	$2.75	$1.85	---	---
C. Net government payments	$16.65	$16.65	$16.65	$16.65	$16,240	$16.65
D. Indemnity payments	$0.00	$0.00	$0.00	$0.00	$0	$0.00
E. Miscellaneous income	$0.00	$0.00	$0.00	$0.00	$0	$0.00
F. Returns/acre	$146.36	$116.56	$108.23	$111.27	$111,728	$114.55
COSTS PER ACRE						
1. Seed	$39.60	$33.60	$9.60	$10.16	$17,073	$17.51
2. Herbicide	20.63	12.78	3.56	25.64	10,094	10.35
3. Insecticide / Fungicide	0.00	0.00	0.00	0.00	0	0.00
4. Fertilizer and Lime	18.89	6.97	17.54	22.84	14,714	15.09
5. Crop Consulting	0.00	0.00	0.00	0.00	0	0.00
6. Crop Insurance	0.00	0.00	0.00	0.00	0	0.00
7. Drying	8.23	0.00	0.00	10.01	2,390	2.45
8. Miscellaneous	6.25	6.25	6.25	6.25	6,096	6.25
9. Machinery Expense	58.10	40.94	42.41	54.78	44,771	45.90
10. Non-machinery Labor	12.50	12.50	12.50	12.50	12,192	12.50
11. Irrigation	0.00	0.00	0.00	0.00	0	0.00
12. Land Charge / Rent	0.00	0.00	0.00	40.38	0	0.00
G. SUB TOTAL	$164.20	$113.04	$91.86	$182.55	$107,330	$110.04
13. Interest on Nonland Costs	6.24	4.52	3.67	5.29	4,198	4.30
H. TOTAL COSTS	$170.44	$117.56	$95.54	$187.84	$111,527	$114.35
I. RETURNS OVER COSTS	($24.08)	($1.00)	$12.69	($20.78)	$201	$0.21

[a] generated using *KSU-Lease* Excel spreadsheet

Table 4. Projected Returns for AVERAGE North Central Kansas Landowner.[a]

Equitable share	33.4%	33.4%	33.4%	33.4%		
Crop/System	Corn	Soybeans	Wheat	Milo	Farm Total	Average Per Acre
Planted acres of each crop	102.0	188.3	452.3	232.7	975.3	—
INCOME PER ACRE						
A. Yield per acre	31.7	10.0	16.73	25.7	---	---
B. Price per unit	$2.05	$5.00	$2.75	$1.85	---	---
C. Net government payments	$8.35	$8.35	$8.35	$8.35	$8,143	$8.35
D. Indemnity payments	$0.00	$0.00	$0.00	$0.00	$0	$0.00
E. Miscellaneous income	$0.00	$0.00	$0.00	$0.00	$0	$0.00
F. Returns/acre	$73.39	$58.44	$54.27	$55.79	$56,020	$57.44
COSTS PER ACRE						
1. Seed	$0.00	$0.00	$0.00	$0.00	$0	$0.00
2. Herbicide	10.35	6.41	1.78	8.56	5,061	5.19
3. Insecticide / Fungicide	0.00	0.00	0.00	0.00	0	0.00
4. Fertilizer and Lime	9.47	3.49	8.80	7.63	7,377	7.56
5. Crop Consulting	0.00	0.00	0.00	0.00	0	0.00
6. Crop Insurance	0.00	0.00	0.00	0.00	0	0.00
7. Drying	4.12	0.00	0.00	3.34	1,198	1.23
8. Miscellaneous	0.00	0.00	0.00	0.00	0	0.00
9. Machinery Expense	3.42	3.42	1.15	3.42	2,308	2.37
10. Non-machinery Labor	0.00	0.00	0.00	0.00	0	0.00
11. Irrigation	0.00	0.00	0.00	0.00	0	0.00
12. Land Charge / Rent	40.38	40.38	40.38	40.38	39,384	40.38
G. SUB TOTAL	$67.74	$53.70	$52.11	$63.33	$55,329	$56.73
13. Interest on Nonland Costs	0.93	0.53	0.47	0.78	590	0.60
H. TOTAL COSTS	$68.67	$54.24	$52.57	$64.12	$55,919	$57.33
I. RETURNS OVER COSTS	$4.71	$4.20	$1.69	($8.33)	$101	$0.10

[a] generated using *KSU-Lease* Excel spreadsheet

Table 5. Estimates of Cash Rent for AVERAGE North Central Kansas Farm.[a]

Crop/System	Corn	Soybeans	Wheat	Milo	Farm Total	Average Per Acre
Planted acres of each crop	102.0	188.3	452.3	232.7	975.3	—
A. Landowner's COST						
Land	$40.38	$40.38	$40.38	$40.38	$39,384	$40.38
Irrigation equipment	$0.00	$0.00	$0.00	$0.00	$0	$0.00
Total	$40.38	$40.38	$40.38	$40.38	$39,384	$40.38
B. Landowner's EQUITABLE SHARE RENT — risk adjustment factor of 5.0%						
Total income	$219.75	$175.00	$162.50	$167.07	$167,747	$171.99
Landowner's share, %	33.4	33.4	33.4	33.4	33.4	33.4
Landowner's income	$73.39	$58.44	$54.27	$55.79	$56,020	$57.44
Landowners' expenses	28.29	13.86	12.19	23.74	16,535	16.95
Income less expenses	$45.09	$44.58	$42.07	$32.05	$39,485	$40.48
Less risk adjustment	2.25	2.23	2.10	1.60	1,974	2.02
Cash rent equivalent	$42.84	$42.35	$39.97	$30.45	$37,510	$38.46
C. Amount Tenant CAN AFFORD TO PAY						
Total income	$219.75	$175.00	$162.50	$167.07	$167,747	$171.99
Total operating expenses	198.73	131.42	107.73	147.46	128,062	131.30
Return to land	$21.02	$43.58	$54.77	$19.60	$39,685	$40.69
Comparison of Alternative Cash Rent Methods						
Low	$21.02	$40.38	$39.97	$19.60	$37,510	$38.46
Average (of A, B, and C)	$34.74	$42.11	$45.04	$30.14	$38,860	$39.84
High	$42.84	$43.58	$54.77	$40.38	$39,685	$40.69

[a] generated using *KSU-Lease* Excel spreadsheet

In the example above, given that a cash rent of approximately $40 per acre just breaks even and results in the landowner receiving the long run average rate of return, why might we observe cash rents of something higher – say $45-$50 per acre? Do landowners currently have more market power than in the past, allowing them to extract higher rates of return from the market? The data in figure 3 would tend to suggest that this is likely not happening. Are farmers willing to receive something less than their full costs to farm the land? If so, they need to recognize that this is not sustainable without income from other sources (i.e., such farmers would need to subsidize the farming operation). Undoubtedly, this does happen in some cases, either because people like the lifestyle of farming, or because they believe they do not have other viable options, and so continue to farm and slowly lose their equity. However, not all producers are willing, or able, to subsidize farming with outside equity. In these cases, they would only pay higher rents if they could be economically justified. Thus, the question is, Is there any economic justification for paying

higher rents when the average profit is $0 (or less)? To answer this question we need to examine some data pertaining to the variability of returns in agriculture.

Variability in management abilities

Agriculture is characterized as being a competitive industry where there are a large number of producers acting as price takers (inputs and outputs) because individual producers do not have sufficient power to influence prices. Another characteristic of a competitive industry is that average profits, after all resources have been compensated, are equal to zero in the long run (which fits our North Central Kansas example quite well). If profits were positive, people would enter the industry, thus driving up costs as they bid for limited resources, such as land, which would ultimately drive profits back down. Likewise, if profits were negative, then people would leave the industry, decreasing the demand for inputs, hence reducing costs, ultimately leading to average profits finding an equilibrium at zero. While this is what we might expect from a theoretical textbook point of view, what we observe in real life is rarely so simple. The reality is that there are fewer farmers today than there were 50, 20, and even 5 years ago, implying that either we are not in the "long run," or that average profits are actually negative in the long run, or maybe something else is going on. It may be that technological advancements continue to redefine the industry and thus we never "reach" the long run. Regardless, the main point is that history has shown that simply being an average producer, in terms of economic returns, is likely not sustainable for multiple generations. Further, the "average" is a moving target – as below average people go out of business the bar continually rises.

Economists have long reported that there are large differences between high and low profit farms. For example, in addition to averages, the Kansas Farm Management Association has reported net farm income by quartile (e.g., high 25%, low 25%) for well over 50 years. Recently, Kansas Farm Management Enterprise Reports have been sorted into high, middle, and low profitability groupings (available online at http://www.agecon.ksu.edu/kfma/). Other states conduct similar analyses that tend to show very consistent results (e.g., Lattz; Nebraska Farm Business Association; Center for Farm Financial Management). That is, there is a significant difference in profitability, often well in excess of $50 per acre, between the high and low profit farms. This suggests that some producers may clearly have an economic advantage over others and hence be willing, and able, to pay more to farm additional land.

A weakness of these high profit versus low profit comparisons is that they typically are based on only one year of data and weather can have a huge impact on the relative profitability across producers in any given year. For example, Beaton, Dhuyvetter, and Albright found that high profit farms had the highest crop yield in 10 of 10 crop enterprises analyzed for the year 2000. However, they also found that the most profitable third of farms also had the lowest average total costs for 9 of the 10 crop enterprises analyzed. For these nine enterprises, differences between machinery and labor costs accounted for roughly two-thirds (65.5%) of the total cost differences between the high and low profit farms. Thus, factors less dependent on weather than yields, those that are more management related, also appear to be important. In other words, while analyses of the variability of profits based on one year of data are suspect because of weather affects on yields (high profit farms one year are not exactly the same ones in the high profit category the next year), they generally hint at the importance of cost control as well. A question that needs

to be answered is, Are differences between high and low profit farms due to management or some random events (e.g., weather)?

In order to determine if profitability differences between high and low profit farms is management related or simply random, a longer term analysis is required. In an analysis of approximately 1,000 farms over a 10-year time period (1992-2001), Kastens, Dhuyvetter, and Nivens examined the persistence of management traits and their impact on profitability.[2] Specifically, they examined whether some producers could *consistently* make greater profits than similarly structured *neighboring* farms. Because external macroeconomic factors, such as prices, often affect an entire industry, it is important to compare profits relative to other industry participants as opposed to profits in absolute levels. Thus, even during especially good or especially bad times for the industry as a whole, individual management differences can still be identified. Furthermore, because random, localized events, such as weather, often mask differences or similarities in management, it is important to observe profit differences among farms that persist over time (e.g., 10 years). Factors included in their analysis were profits, yields, costs, prices, less-till adoption, planting intensity, percent of crop acres rented, government payments, and farm size. To determine if persistence exists, each of the management measure's annual values for a farm were averaged over the 1992-2001 period and then this average was tested to see if it was statistically different from 0 (from the average or typical farm).

Statistical significance is important for establishing confidence in results. For example, consider hypothetical farm A, which is assumed to have this annual profit stream over 5 years: {!$80, $200, !$50, $300, !$270}. The average annual profit for farm A is $20/acre. What would you expect farm A's profit to be in year 6? Although your best guess is likely $20/acre you would have little confidence in that prediction. With the large variability displayed in farm A's profits, it can easily be shown that its $20/acre profit is not statistically different from 0. Now consider farm B whose profit stream is {!$5, $30, $20, $25, $30}. Like farm A, farm B's average profit is also $20/acre. Now, however, it is much easier to have confidence in a $20 prediction for year 6. In this case, the $20 average is statistically different from 0. Thus, farm B's profits are said to be substantially more *persistent* than farm A's. It is much easier to believe that farm B's manager has the management skills necessary to make positive profits of $20/acre. On the other hand, it appears farm A's $20/acre profits might be due chiefly to chance. In other words, the profits of farm B are persistent while the profits of farm A are much more random. This same approach was used to test each of the management measures (profits, yields, costs, prices, less-till adoption, planting intensity, rent, government payments, and farm size) – only there were 1,000 farms with 10 years of data (compared to only two farms with five years of data in the statistical example).

Based on the approximately 1,000 farms tested, figure 4 shows persistence of management traits by reporting the percent of farms whose 1992-2001 average management measure was statistically different from 0 (from the average farm in that area). In other words, farms that are like "Farm B" in the preceding hypothetical example. With 85 and 83 percent of the farms statistically different from 0, farm size (Size) and the percent of acres rented (Rent), respectively, are shown to be highly persistent among farmers.

[2] For a detailed description of their analysis see Nivens, Kastens and Dhuyvetter.

This is not unexpected as it simply means that, from year to year, farm size (either large or small) tends to be fairly constant and that producers tend to rent a consistently high or low percent of their crop acres. While farm size is highly persistent, it (along with government payments) is typically "less manageable" by producers than the other traits, at least in the short run. Therefore, of the manageable traits, the next most persistent measure, with 67 percent of the farms statistically different from 0, is planting intensity (Plant). That is, producers tend to have consistently low or high planting intensity, not jumping about from year to year.[3] Less-till technology adoption (Tech) and cost (Cost) were the next most persistent management traits, where nearly 60 percent of the farms were persistently better or worse than their neighbors on average. A smaller number (41%) of farms were significantly better or worse at yields than their neighbors. This should not be too surprising given that crop yields are so weather dependent – even in a 10-year analysis. Thus, while analyses based on only one year of data often point to the importance of yield, this longer term analysis indicates that being consistently better than average for yields is more difficult than for other management factors. The least persistent management measure is prices, where only 25 percent of the farms were significantly higher or lower than the average.

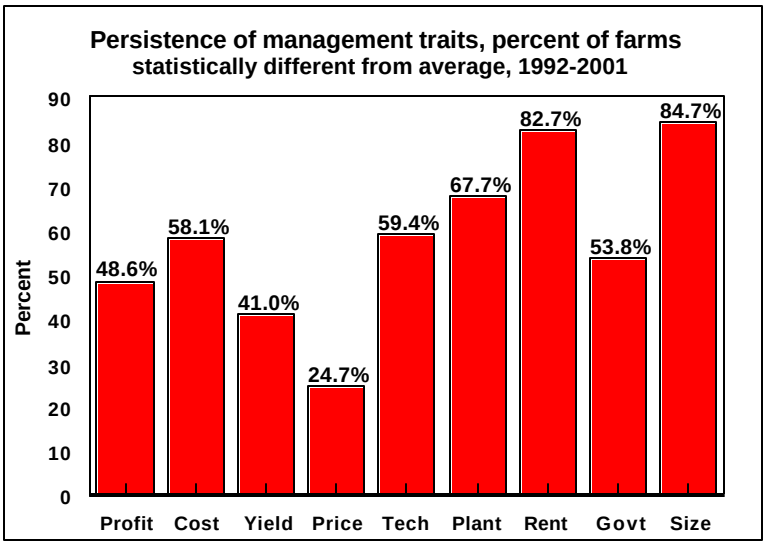

Figure 4

For farms wishing to differentiate themselves from their neighbors, figure 4 suggests which management aspects should be the easiest ones to focus on – those with the greatest persistence. For example, it should be relatively easy for a farm to set itself off from its neighbors, presumably to make more profit, by either increasing or decreasing the percent of acres rented or planting intensity. We know that because so many farms have demonstrated they can do it. On the other hand, the low persistence on prices suggests it will be difficult for a farm to become better at achieving higher prices than its cohorts. However, the appropriate effort expended to achieve higher prices ultimately depends on the potential payoff, which is discussed later.

[3] Planting intensity is defined as nonirrigated acres planted divided by total nonirrigated acres. The interpretation of this 67 percent is as follows – approximately 33.5 percent (67 / 2) of producers consistently plant more intensively than average while another 33.5 percent (67 /2) of producers consistently plant less intensively than average. The remaining 33 percent of producers (100 - 67) are not consistent in their planting intensity from year to year. That is, they are more like "Farm A" in the hypothetical example in that their planting intensity tends to "jump about" from year to year.

How variable are the different management measures? Table 6 reports the average and the standard deviation for each of the measures. The average equals zero for each measure by definition because each variable is defined as being the "difference from neighbors" and thus the average of all of these differences is equal to zero. A standard deviation is a statistical measure of variability and is representative of the average of the top (bottom) thirds.[4] For example, the standard deviation of profits is $75.30 per acre, which would imply that there is about a $150/acre difference between the average producer in the top third and the average producer in the bottom third (+$75.30 for top-third producers and –$75.30 for bottom-third producers). In addition to a seemingly wide range of profitability, there is considerable variability for most of the management measures. Farms that have costs that are one standard deviation lower than the mean have costs that are 31.9 percent below the typical comparable neighbor. The top managers for crop yields have 14.4 percent higher yields than average. Figure 4 showed that it would likely be difficult to become a superior price manager. Table 6 shows that even those who are good (poor) at pricing (one standard deviation change from mean) get prices only 8.7 percent higher (lower) than the average. In general, each value in table 6 is expected to have the same likelihood of occurrence. That is, it should be as easy to get 31.9% lower costs as it is to get 8.7% higher prices.

Table 6. Variability of Management Measures: Average and Standard Deviation.

Measure[a]	Average	Standard deviation[b]
Profit, $/ac	0.00	75.3
Cost, %	0.00	31.9
Yield, %	0.00	14.4
Price, %	0.00	8.7
Less-till technology adoption, years	0.00	42.2
Planting Intensity, %	0.00	22.6
Percent of crop acres rented, %	0.00	44.8
Government payments, %	0.00	70.3
Size, %	0.00	80.0
Risk (profit variability across years), %	0.00	66.8

[a] All management measures are in terms of "difference" from neighbors. Profit represents the average $/ac difference between producers. Each of the other variables, with the exception of technology adoption, represents the "percent difference" from the average for that variable. Technology adoption represents the number of years ahead, or behind, a producer is from the average producer in the region.

[b] A standard deviation represents the average producer who is in the top third (bottom third for negative standard deviation). For example, the yield advantage for the typical or average producer in the top third of yields would be

[4] With data that follow a normal distribution (i.e., the bell-shaped curve), the mean plus one standard deviation is roughly equivalent to the average of the top-third of the data and the mean minus one standard deviation is comparable to the average of the bottom-third. Thus, evaluating the impact of a specific management trait at plus (minus) one standard deviation is similar to talking about a producer being in the top (bottom) third of producers with regard to that management trait.

The information in figure 4 and table 6 shows that some management traits are more persistent than others (i.e., producers have been able to differentiate themselves from their neighbors) and that considerable variability exists. However, nothing has been said about the profitability associated with the different management traits. In order for producers to make decisions about where to focus their management efforts they need to know what the expected payoffs are. To quantify the relationship between profitability and the different management traits, the difference in profitability between producers was modeled as a function of the different management traits.

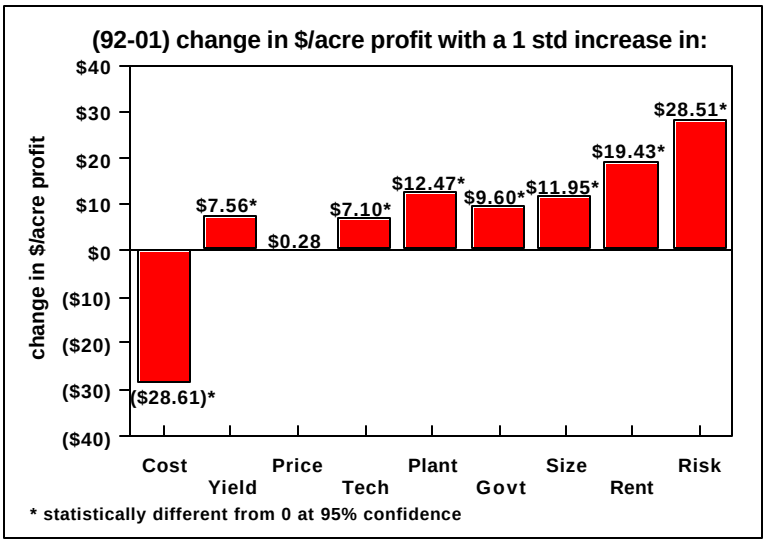

Figure 5

Figure 5 shows the impact on profit per acre for each of the management traits evaluated at one standard deviation for that particular trait. Thus, the values in figure 5 are loosely interpreted as how much more (less) profitable a producer is that is in the top third of each management category than an average producer (note that being in the top third of costs, i.e., having *above* average costs, results in being less profitable). Roughly, it should be as easy to be one standard deviation above or below the mean in one category as another. Cost control is clearly one of the most important management traits to focus on as producers that are in the high-third of costs have profits that are $28.61 per acre *less* than the average, all else equal. On the other hand, producers in the bottom third of costs, i.e., low-cost operators, would have profits $28.61 per acre *greater* than the average, resulting in a difference between high-cost and low-cost operators of $57.22 per acre. Being one standard deviation above the mean for farm income variability impacts profits almost as much as costs, however, this is not necessarily a desired management factor. Of the other factors that are within the managers control, being one standard deviation above the mean in terms of percent of crop acres rented significantly impacted profits, followed by an increase in planting intensity, and then by yields or technology adoption. Going from a farm with average yields to one standard deviation above the average implies 14.4 percent higher yields, which implies $7.56/acre higher profits. Thus, having better than average yields is important, however, as expected, the relative importance of yields is less than what is typically observed in single-year analyses. The impact of being in the top price-wise, at $0.28/acre, was not statistically different from 0. Although changing either size or government payments would have significant impacts on profit, here they are not considered manageable traits as it is generally not within the realm of the manager to do so.

The results shown in figures 4 and 5 confirm that farm operators who wish to improve profitability by improving management might do well to focus less on price and more on costs, land tenure, planting intensity, technology, and yields. It was somewhat surprising to see that the percent of crop acres rented, as opposed to owned, had that much impact on profits. Further, this is not merely a size effect, as that

effect is already captured by the size variable. This is not to say that land ownership is unprofitable, only that renting land tends to be more profitable. As producers consider where to focus their management efforts, because some management traits are related, keep in mind that the values shown in figure 5 are additive. For example, a producer that is in the top third of technology adoption (i.e., the use of less tillage) may also be in the top third with regards to planting intensity and thus would be expected to be $19.57 ($7.10 + $12.47) per acre more profitable than a producer that is average in both of these categories, all else equal.

The information in this section has clearly shown that considerable variability exists among producers in terms of many of their management abilities and ultimately their profitability. It has also shown that some management traits are much more persistent than others. The next question is, How might this impact how much different producers can pay for land? This question is answered by changing some of our baseline assumptions for the representative farm in North Central Kansas that was presented in the previous section.

Equitable crop share and cash rents for North Central Kansas – ABOVE AVERAGE farmer

The cost and yield assumptions presented in table 2 are modified based on information from table 6 to examine how a producer being "better than average" impacts equitable crop share or cash rent leases as calculated by *KSU-Lease*. Specifically, the impact of a producer having costs 10% lower than the average, yields 5% higher, and both lower costs (–10%) and higher yields (+5%) were scenarios considered. Based on the values presented in table 6, where the yield and cost advantages of top third producers was +14.4% and 31.9%, respectively, these scenarios are not only likely to occur but also quite conservative. That is, a large portion (1/6) of the farms likely are even better than the typical farm in the high third of a management category.

Based on the results of Beaton, Dhuyvetter, and Albright, approximately two-thirds of the cost reduction was in the labor and machinery categories with the other one-third being in the seed, fertilizer, insecticide, and herbicide categories. That is, most of the cost reductions were assumed to be in "non shared" categories. It is assumed that this above average producer gets higher yields because of better management abilities and not because the land is of higher quality or because of increased use of inputs. Thus, in the higher yield scenarios all costs are held constant except harvesting and drying costs. For the baseline (i.e., average farmer) and each of the "better than average" scenarios, table 7 reports the following: (1) return over total costs, (2) tenant and landowner equitable crop share percentages, (3) average and maximum cash rent values, (4) land value that would result in returns over economic costs equal to zero, and (5) equitable crop share percentages for the tenant and landowner at this higher land value.

By reducing total costs 10%, returns over total cost increase from $0.31 per acre for the average producer to $17.48 to the low-cost producer. The equitable crop share for the tenant in this case decreases to 62.9 percent because of his/her lower contributions. Note, a producer should not be "penalized" for having costs that are below average nor should high cost producers be "credited" for being inefficient, which is

why it is generally recommended to use average costs and yields when using *KSU-Lease*.[5] Remember that in an equitable crop share lease returns over total costs are shared proportionately and thus a low cost producer could "accept" a lower share of the crop and still be better off than an average producer. For example, the average producer would receive 66.6% of $0.31 per acre, whereas, the low-cost producer would receive 62.9% of $17.48 per acre. Thus, while it may appear that the low-cost producer is being "penalized" for having low costs they may agree to this arrangement in order to rent the additional ground because profits are positive. Similarly, the low-cost scenario shows that the average cash rent (average of three methods shown in table 5) increases almost $8 per acre. Furthermore, the maximum of the three methods increases by the full $17 per acre increase in returns over total cost. If returns are consistently above zero, then likely land values will increase. In this lower-than-average cost scenario, if land values were to increase to $964 per acre and continue to generate a 6% return, the $17.48 return over total costs would be driven to $0. If land values increased to this level and assuming nothing else changed, the equitable crop shares would be 54.2% for the tenant and 45.8% for the landowner. Obviously, land costs would only increase to $964 if the landowner was receiving all of the original return over total costs of $17 per acre. If the landowner received only some portion of it (i.e., the tenant is able to retain part of his/her cost advantage), then land values would increase to some lower level and some positive return over total costs would be realized.

The impact of a producer being 5% better than average with respect to yields (no change in costs other than harvesting and drying) shows that cash rents might be expected to increase from $4-$7 per acre over the baseline scenario. In this case, the calculated equitable crop share remains approximately unchanged (the ever so slight difference is due to slightly higher costs associated with harvesting). The return over total cost advantage of over $6 per acre could lead to land value increases of slightly more than $100 per acre over the baseline scenario. If this happened, the equitable crop shares would change to 63.3% for the tenant and 36.7% for the landowner.

Assuming the above average producer had both 10% lower costs and 5% higher yields, it can be seen that cash rents could increase significantly relative to the baseline scenario (i.e., average yields and average costs). The average cash rent and maximum cash rent values calculated by *KSU-Lease* are approximately $10 and $25 per acre higher, respectively, when compared to the baseline. The return over total costs of almost $25 per acre could lead to substantially higher land values and significantly impact the relative contributions of the landowner and the tenant.

[5] Likewise, landowners who may be able to buy land at "below market rates" (presumably because they are good negotiators) should not be penalized by using their "low" land value in the *KSU-Lease* program. Rather, an average market value should be used. Of course a similar, but opposite, argument holds true for somebody that buys land at above market rates.

Table 7. Impact of Being ABOVE AVERAGE on Land Rent for North Central Kansas.[a]

		Management Factor Advantage		
	Baseline	Cost, –10%	Yield, +5%	Cost, –10% Yield, +5%
Return over total cost, $/ac	$0.31	$17.48	$6.70	$24.83
Equitable crop share percentage				
Tenant, %	66.6	62.9	66.8	62.9
Landowner, %	33.4	37.1	33.2	37.1
Average cash rent, $/ac [b]	$39.84	$47.59	$42.65	$50.90
Maximum cash rent, $/ac [b]	$40.69	$57.86	$47.08	$65.21
Land value where return over total cost = $0 (annual land cost based on 6% rent-to-value ratio), $/ac	$678	$964	$785	$1,087
Equitable crop share percentage at land value where return over total costs = $0				
Tenant, %	66.4	54.2	63.3	51.2
Landowner, %	33.6	45.8	36.7	48.8

[a] generated using *KSU-Lease* Excel spreadsheet

[b] See table 5 for example of how this values is calculated.

Based on the information displayed in table 7, it is easy to see how land rental arrangements (and land values) can be impacted significantly by the management ability of the producer. Crop share arrangements will be impacted if low-cost producers are willing to "pass on" all, or part, of their advantage to landowners in the form of taking a smaller share of the crop than otherwise might be dictated. In our example, an average producer would require 66.6% of the crop to cover his/her costs, however, a producer with 10% lower costs and 5% higher yields could agree to a 60 / 40 arrangement and still cover his/her costs.[6] Alternatively, this better-than-average producer might agree to a cash rent of $50-$60 per acre because he/she would still be covering total costs. The problem obviously arises when above average producers bid up land rents (either with higher cash rents or better crop share terms) to levels that they can economically justify but average and below average producers cannot. Thus, differences between profitability for producers can lead to similar results as discussed earlier – i.e., profitable farms tend to bid up prices, which leads to average and below average farms needing to also pay these higher rents.

[6] Based on all of the assumptions in this example a 60/40 arrangement would not be equitable (table 7 shows that the equitable arrangement would be 62.9/37.1). However, a low-cost producer receiving 60% would still be significantly better off with this "non equitable" lease than an average producer with an equitable lease.

However, in order to do this, average farms will need to subsidize the farming with either off-farm income or equity, which may or may not be sustainable in the long run. Remember, the –10% costs and +5% yield differences considered here are quite conservative relative to what has been observed with producers that have been in the top third of those categories out of 1,000 farms that have been continuously enrolled in the Kansas Farm Management Association.

The previous section describes, from an economist's viewpoint, the classical "treadmill" that is often referenced regarding farm structure over the decades. That is, farmers must continuously get better and larger over time in order to survive. The social impact of this treadmill has been hotly debated for many years, resulting in numerous policies intended (at least in appearance) to arrest such social change. However, in a more-or-less market economy, like that in the U.S., when farmers are generally free to purchase profit enhancing technologies as they emerge, it is difficult to see how anything short of massive laws aimed squarely at restricting technology (e.g., outlawing tractors) would actually change the trends that have been in place for centuries.

Summary and Conclusions

Land values are important to Kansas agriculture as they represent over 75% of the total agricultural assets in the state. Furthermore, on an annual basis, land costs account for approximately 25% of total production costs of typical nonirrigated crops. Thus, it is easy to understand why talk of land values and rents is of great interest to so many people. It is also easy to understand why people might become concerned if land values and rents are perceived to increase to levels that are not economically justified.

In Kansas, equitable crop share arrangements are often determined using the "contributions approach" and thus the portion of total costs that land accounts for is important in determining rental rates. Nonirrigated crop land in Kansas has historically earned about a 6% return from cash rents (i.e., cash rent-to-land value ratio of 6%). There has been no upward trend in this ratio for the last 20 years in Kansas suggesting that, on average, landowners have not been able to exert market power and increase their returns at the expense of tenants. Many factors affect crop land rental rates (e.g., government policy, taxation, tradition, technology), thus understanding why rental rates and terms vary is a complex issue. This paper examines the impacts of management abilities on both equitable crop share and cash rents. The results of this analysis indicate that above-average producers may be economically justified in bidding up rents even during times when average producers are losing money. While this analysis is quite simplified, it makes it clear why land rents, hence land values, can vary as significantly as they do. In other words, varying management abilities can explain why paying "high" land rents (either cash or crop share) may be "foolish" for some producers but be the result of rational business decisions for other producers. The answer to the question of why are land rents so high may be as simple as "because there is competition in agriculture and the market is working."

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