

## ANSWER KEY for Land Ownership and Leasing – Homework #2 (MAST 11-12)

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This homework is based on using the *KSU-Lease.xls* spreadsheet. This spreadsheet is available on the website: [www.agmanager.info](http://www.agmanager.info).

### *Disclaimer:*

This homework is a fairly tough homework (i.e., it entails more data entry and requires you to move around in the *KSU-Lease* spreadsheet more than some of the other homework problems). Because of the larger number of inputs, a spreadsheet has been provided with values already pre-entered. However, you are encouraged to access the Farm Management Guide budgets and familiarize yourself with information that is available and what would be required so that you will feel comfortable entering data for your own situations in the future. You will likely find that while the initial effort may be somewhat painful, after working through an example or two using the *KSU-Lease* spreadsheet the process is really quite easy. Finally, you are reminded to rely upon the paper explaining the use of this spreadsheet that is available at [www.agmanager.info/farmmgmt/land/lease/tools/KSU-Lease.PDF](http://www.agmanager.info/farmmgmt/land/lease/tools/KSU-Lease.PDF).

### *Situation:*

You are a central Kansas producer and currently have the opportunity to rent 320 acres (315 tillable) from a retiring farmer. This expansion is consistent with your long term goals of increasing farm size and will not be a problem given your current labor and machinery resources. Of the total acres on this farm, 160 will be planted to wheat annually, 25 acres planted to corn, 50 acres planted to full-season soybeans, and 80 acres planted to grain sorghum (milo). The landowner is flexible with regard to the specific terms of the lease (e.g., crop share, cash, inputs shared), but he understands the concept of equitable leases and wants to make sure both parties are being treated “fairly” in the final lease agreement. Your job is to examine alternative leasing arrangements and make a proposal to the landowner.

Your first step to analyzing this lease is to develop crop budgets for each of the crops (i.e., identify all of the contributions). The following tables represent expected costs and returns for each of the crops on this farm. The inputs are “roughly” based on 2010 K-State projected budgets with updated values for fertilizer and other inputs which you and the landowner agree to use as a starting point for your analysis. The information in the “shaded” cells needs to be entered into the *KSU-Lease.xls* spreadsheet (i.e., the blue numbers) – if you have a copy of the *KSU-Lease-Homework.xls* file the inputs have already been entered.

TABLE 1. CROP BUDGETS SHOWING TOTAL COSTS AND RETURNS

Crop/System	Wheat	Corn	SB	Milo	DC SB	Alfalfa	Total	Per Acre	Per Acre
Planted acres of each crop	160.0	25.0	50.0	80.0	0.0	0.0	315.0		
Tillable acres per planted acre	1.00	1.00	1.00	1.00	0.00	1.00	315.0	Planted	Tillable
<b>INCOME PER ACRE</b>									
A. Yield per acre	44.0	75.0	28.0	75.0	20.0	3.3	---	---	---
B. Price per unit	\$6.00	\$3.75	\$9.00	\$3.60	\$9.00	\$110.00	\$83,471	---	\$264.99
C. Net government payments	\$14.00	\$14.00	\$14.00	\$14.00	\$0.00	\$14.00	\$4,410	\$14.00	\$14.00
D. Indemnity payments	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0.00	\$0.00
E. Miscellaneous income	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0.00	\$0.00
F. Returns/acre ((A x B) + C + D + E)	\$278.00	\$295.25	\$266.00	\$284.00	\$180.00	\$371.50	\$87,881	\$278.99	\$278.99
<b>COSTS PER ACRE</b>									
1. Seed	\$15.00	\$77.28	\$46.20	\$15.69	\$49.50	\$12.30	\$7,897	\$25.07	\$25.07
2. Herbicide	6.29	28.87	14.95	34.10	9.08	6.24	5,203	16.52	16.52
3. Insecticide / Fungicide	27.90	0.00	0.00	0.00	0.00	3.00	4,464	14.17	14.17
4. Fertilizer and Lime	50.50	55.00	23.75	55.00	15.00	35.00	15,043	47.75	47.75
5. Crop Consulting	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
6. Crop Insurance	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
7. Drying	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
8. Miscellaneous	6.25	6.25	6.25	6.25	5.00	6.25	1,969	6.25	6.25
9. Machinery Expense	113.12	93.16	76.63	100.88	63.32	124.58	32,330	102.63	102.63
10. Non-machinery Labor	9.75	9.75	7.80	10.40	6.50	16.25	3,026	9.61	9.61
11. Irrigation	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00
12. Land Charge / Rent	55.00	55.00	55.00	55.00	0.00	55.00	17,325	55.00	55.00
G. SUB TOTAL	\$283.80	\$325.31	\$230.58	\$277.32	\$148.40	\$258.62	\$87,256	\$277.00	\$277.00
13. Interest on 1/2 Nonland Costs	6.68	8.37	5.25	6.60	4.45	5.67	2,069	6.57	6.57
H. TOTAL COSTS	\$290.49	\$333.68	\$235.82	\$283.92	\$152.85	\$264.28	\$89,325	\$283.57	\$283.57
I. RETURNS OVER COSTS (F - H)	(\$12.49)	(\$38.43)	\$30.18	\$0.08	\$27.15	\$107.22	(\$1,444)	(\$4.58)	(\$4.58)
J. TOTAL COSTS/UNIT (H/A)	\$6.60	\$4.45	\$8.42	\$3.79	\$7.64	\$81.32	---	---	---
K. RETURN TO TOTAL COST ((I+13)/G)	-2.05%	-9.24%	15.36%	2.41%	21.29%	43.65%	-1.62%	-1.62%	-1.62%

TABLE 2. Production Inputs Used for Budgets

ITEM	Wheat	Corn	SB	Milo	DC SB	Alfalfa	\$/unit
Seeding rate (lbs, seeds, etc)	100	24	140	4.67	150	3	
Seed price, \$/unit	\$0.15	\$3.22	\$0.33	\$3.36	\$0.33	\$4.10	
<b>Fertilizer:</b>							
82-0-0	25.0	50.0	0.0	50.0	0.0	0.0	\$0.450 /lb
N (dry/liquid)	25.0	10.0	0.0	10.0	0.0	0.0	\$0.650 /lb
P	24.0	28.0	25.0	28.0	20.0	40.0	\$0.750 /lb
K	0.0	0.0	0.0	0.0	0.0	0.0	\$0.650 /lb
Lime	500.0	500.0	500.0	500.0	0.0	500.0	\$0.010 /lb
<b>Herbicide</b>							
Finesse	0.3						\$17.62 /oz
+ Surfactant	1						\$1.00 /ac
Status		1					\$3.00 /oz
Bicep II Magnum		2		1.6			\$10.92 /qt
Buctril + Atrazine				2			\$6.30 /pt
Glyphosate		32	64	32	64		\$0.11 /oz
+ Ammonium Sulfate		1.5	4.5	1.5	6		\$0.34 /lb
Roundup Weather Max			22				\$0.29 /oz
Pursuit						1.2	\$5.20 /ac
xxx							\$0.00 /ac
<b>Insecticide / Fungicide</b>							
Force 3G							\$4.83 /lb
Capture 2EC							\$141.09 /lb
Headline	9						\$3.10 /oz
Warrior 1EC						3	\$1.00 /ac
Irrigation water, inches/acre							\$4.00 /in
Irrigation repairs, \$/acre-inch							\$0.50 /in
Drying cost, \$/unit (bu, cwt, etc)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	

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TABLE 3. Machinery and Land Resources Used for Budgets

ITEM	Wheat	Corn	SB	Milo	DC SB	Alfalfa	\$/unit
Drill/Plant, \$/acre	\$11.75	\$14.07	\$14.32	\$14.01	\$14.32	\$2.76	
<b>Tillage and Chemical Applications:</b>							
Chisel	1	0	0	0	0	0	\$11.01 /ac
Disk	1	0	0	0	0	0.2	\$9.20 /ac
Field cultivate	1	0	0	0	0	0.2	\$9.15 /ac
Harrow	0	0	0	0	0	0.4	\$8.23 /ac
Anhydrous application	1	1	0	1	0	0	\$10.99 /ac
Fertilizer application	0	1	1	1	0	1	\$4.96 /ac
Herbicide application	1	2	3	2	2	0.2	\$5.10 /ac
Insecticide/fungicide application	1	0	0	0	0	1	\$5.10 /ac
<b>Harvest</b>							
Base charge, \$/acre	\$22.27	\$27.01	\$26.76	\$23.68	\$26.76	\$49.11	
Charge for high yields, \$/unit	\$0.217	\$0.204	\$0.209	\$0.222	\$0.209	\$11.820	
High yield	22	74	28	36	28	0	
Hauling, \$/unit	\$0.205	\$0.181	\$0.189	\$0.203	\$0.189	\$0.000	
Non-machinery labor, hr/acre	0.75	0.75	0.60	0.80	0.50	1.25	\$13.00 /hr
Irrigation labor, hr/acre	0.00	0.00	0.00	0.00	0.00	0.00	\$13.00 /hr
Average land value, \$/acre /A	\$55	\$55	\$55	\$55	\$55	\$55	
Annual return to land, % /A							100.0%
Interest on capital, %							7.0%
<b>Irrigation Equipment</b>							
	Investment, \$		Years		Salvage value, %		
	Total	\$/wet ac					
Well, pump and gearhead value	\$0	n/a		25		0%	
Power unit and meter	\$0	n/a		7		0%	
Irrigation system	\$0	n/a		20		10%	

/A – The annual cost associated with land can either be entered as a Land Value x Rent-to-Value OR as a Cash Rent x 100%. For example, if cash rent in region is \$42 per acre, this can be entered as \$42 in row 94 and 100% in cell K95 OR as \$840 in row 94 and 5% in cell K95 [\$42 x 100% = \$840 x 5%].

TABLE 4. Alternative Yield and Price Scenarios (minimum of one must be entered)

Yield scenarios to consider							
	Wheat	Corn	SB	Milo	DC SB	Alfalfa	Use (Y=1, N=0)
Used in analysis above	44	75	28	75	20	3.25	1
Expected yields	44	75	28	75	20	3.25	1 (base)
Low yield scenario	38	60	22	65	12	2.5	0
Slightly lower than average	40	67	25	70	16	3	0
Slightly better than average	48	85	30	80	24	3.5	0
High yield scenario	52	100	35	90	28	4	0
Price scenarios to consider							
	Wheat	Corn	SB	Milo	DC SB	Alfalfa	Use (Y=1, N=0)
Used in analysis above	\$6.00	\$3.75	\$9.00	\$3.60	\$9.00	\$110.00	1
5-yr average harvest (local coop)	\$6.00	\$3.75	\$9.00	\$3.60	\$9.00	\$110.00	1 (base)
5-yr avg for region (mktg year)	\$5.97	\$4.13	\$9.82	\$3.93	\$9.82	\$114.00	0
10-yr avg for region (mktg year)	\$4.65	\$3.13	\$7.77	\$2.95	\$7.77	\$99.00	0
Current futures + basis (2011-2014)	\$6.60	\$5.50	\$11.25	\$5.00	\$11.25	\$110.00	0
Slightly better than average	\$6.00	\$4.25	\$10.00	\$4.00	\$10.00	\$120.00	0

Machinery cost adjustment (percent of values entered in Table 2)

115.0%

In the event you have chosen to manually enter data (good practice), to verify that you have entered all information correctly into the spreadsheet, the return over total costs should match that above: -\$1,444 (farm), -\$4.58 (planted acre), and -4.58 (tillable acre). If these numbers do not match, check that you have entered the inputs correctly.

Note: unless specified otherwise, shared inputs are to be shared equitably (i.e., in the same percentage as the income) which is accomplished by entering a -100% as the operator's share (the only place where inputs are not shared equitably, is miscellaneous costs where it is assumed 80% of those are from the operator and 20% from the landowner). Also, make sure that cell L4 in the "Shares" tab is set at 0 for your entire analysis.

**Question #1:**

Based on equitably sharing fertilizer (including lime), herbicides, insecticides & fungicides, and chemical applications, and the operator (you) paying 100% of all other costs except miscellaneous which is 80% for operator and 20% for the landowner, answer the following:

- a. What are the equitable crop share percentages for the landowner and the operator when land is valued at \$55/acre cash rent?
- b. Given a 0% risk adjustment factor (cell G92 in the Lease budgets tab), what is the average cash rent per tillable acre from the three methods across all crops on the farm at 5-year average prices?
- c. What is the implied risk premium associated with a \$55 per acre cash rent?

**Answer:**

- a. The equitable crop share percentages are 70.3% for the operator and 29.7% for the landowner. These are also the percentages that all "equitably shared" costs (i.e., those where -100% was entered in the spreadsheet, i.e., fertilizer, herbicide, insecticide, and insecticide application) would be split between the landowner and the tenant. As a side note, if the landowner and tenant desired a 1/3 – 2/3 arrangement, it works out that sharing seed costs on the row crops results in that being the approximate split holding all else constant.
- b. Average cash rent from the three methods is \$53.02 with a range of \$50.42 to \$55.00 (see rows 111-113 in the Lease budgets tab). The reason these three values are so close to each other (i.e., very little difference between the low and high values) is because the expected profit (-\$4.58/acre) is very close to zero. That is, as profit approaches zero, which is what we expect in the long run, the three cash rent methods converge.
- c. The risk premium that would drive the cash equivalent of a share rent to \$55 per acre is actually a negative 2.54%. That is, assuming all values are correct, a landowner that receives \$55 per acre would actually be receiving more than he/she would expect with an equitable crop share arrangement (however, remember this is based on current costs and 5-year average prices).

**Question #2:**

Continuing with your previous assumptions, only using current projected prices for the future rather than 5-year averages, answer the following:

- a. If you pay \$55/acre cash rent, what is the implied risk premium at these higher prices and assuming approximately a 70/30 crop share arrangement?

- b. How much could cash rent increase such that return over total costs (economic profit) is approximately \$20/acre?
- c. How does this higher cash rent impact the equitable crop share split assuming the same costs continue to be shared?

**Answer:**

- a. At these higher prices, the landowner would expect to receive \$71.62 per acre with an equitable crop share arrangement and thus if he/she receives \$55 per acre with a cash rent that represents a risk premium of 23.2% (i.e., by entering 23.2% int cell G94, the cash rent equivalent value in cell M101 exactly equals \$55.00).
- b. The answer to this first question is found through an iterative process – i.e., changing cash rent and seeing the impact that has on the return over total costs – line I in the Crop budgets tab. For example, if cash rent is increased from \$55 (base value) to \$75 (guess), return over total costs decrease from \$55.91 to \$35.91, which is still above the “target” of \$20 implying the rent should be increased slightly. Increasing the guess to \$90 results in a return over total costs of \$20.91 (we’ll call that close enough). This suggests that if commodity prices are expected to remain high cash rents likely will increase significantly.
- c. If the land contribution increases from \$55 to \$90 per acre, holding all else constant, the equitable crop share terms would change from ~30/70 to ~40/60. Keep in mind that this also means that the landowner would now pay 40% of all shared expenses as well (i.e., any expenses identified as being shared equitably (-100%)).

**Question #3:**

Continuing with your previous assumptions regarding cash prices and land rent at \$90/acre, answer the following:

- a. If the landowner’s only expense is 20% miscellaneous (and their share on crop insurance and drying), what would the equitable arrangement be (i.e., what are the terms for a net share lease)?
- b. How does this compare to when land rent is \$55/acre?

**Answer:**

- a. To find the equitable share percentages of a net share rent all values in the Shares tab should be set to 100% (except Miscellaneous which is 80% and Crop insurance and Drying which are -100%). Doing so results in the equitable percentages being 71.3% for the Operator and 28.7% for the Landowner. This suggests that the increase in land rents essentially allows the landowner to continue receiving roughly the same share they were before without sharing any expenses. Alternatively, as was shown in 2c, if they continue to share expenses, then they would be entitled to a larger percent.
- b. To find what the net share rent percentages would be with land valued at \$55/acre simply change

land rent from \$90 to \$55 (you do not need to change the prices as crop share percentages are based solely on contributions and thus income does not directly impact the results). At \$55/acre, the net share rent percentages are 80.1% for the Operator and 19.9% for the Landowner. It is important to recognize that this result is really only relevant if crop prices fall and land rents remain in the range of \$55/acre (and all other inputs remain at current levels).

**Question #4:**

Assuming that land rents increase to \$90 per acre in response to the higher commodity prices, what is the landowner's expected return to land (\$/tillable acre) under each of the following:

- a. Cash rent?
- b. Equitable crop share with landowner sharing fertilizer, chemicals, and chemical applications (i.e., same inputs as previously shared)?
- c. Equitable crop share with tenant paying all inputs except 20% of miscellaneous and landowner's share of crop insurance and drying (i.e., net share rent)?

**Answer:**

- a. Obviously if the land rent is \$90 per acre that is what the landowner's return to land will be with a fixed cash rent.
- b. If the landowner receives 40.7% of the crop and pays the same percentage of fertilizer, chemicals, and chemical application, his/her expected return to land will be \$98.51. This is roughly 10% higher income than the cash rent of \$90/acre.
- c. If the landowner receives 28.7% of the crop and the operator pays for all production inputs, his/her expected return to land will be \$95.99. In this case the landowner will have production (yield) and market (price) risk, but not risk associated with changing input prices.

**Question #5:**

What is the lease arrangement(s) you would propose to this landowner?

**Answer:**

There is no "right" answer to this question. In this example, we saw equitable arrangements for the landowner that ranged from ~30% sharing no inputs to ~40% if inputs were shared when land was valued at \$90 per acre. Similar values when land was valued at \$55 per acre were ~20% and ~30%, respectively, pointing to how sensitive results are to assumptions about land prices. Thus, the most important thing is likely for the landowner and tenant to be communicating about what is an appropriate land charge to use. Locking in a multi-year fixed cash rent at \$55/acre would seem inappropriate given current prices. However, locking in a multi-year fixed cash rent at \$90/acre also is risky unless commodity prices are simultaneously locked in.