# Determining Equitable Crop Share or Cash Rental Arrangements Using the *KSU-Lease* Spreadsheet

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## Background

Crop producers rely heavily on rented land in their farming operations. In a 1994 survey of producers belonging to the Kansas Farm Management Associations, Langemeier, Albright, and Delano found that nearly 90 percent of the operations used rented land.[1] Furthermore, from 2000-2002 the average percent of crop acres farmed that were rented by Farm Management members was 68% (KFMA, *Annual ProfitLink Summary*). Because rented land is so important in farming operations, the rental arrangements between landowners and producers can have significant impacts on the risk and returns of those operations. Thus, it is crucial that producers understand how changing production practices impact rental arrangements and how different rental arrangements affect their operations.

Crop land is typically rented in one of three ways: cash rent, crop share, or cash/share combination. The *KSU-Lease* spreadsheet can be used to determine rental arrangements for each of these three situations. This paper is meant to give a brief overview of the economic principles used in the development of *KSU-Lease*. For a more detailed explanation and discussion of developing equitable leases see Langemeier (1997a, 1997b) and Dhuyvetter, Kastens, and Outlaw (1999a, 1999b). To determine a flexible cash rent, see the *FlexRent* spreadsheet available at www.agmanager.info.

## Determining equitable crop share percentages

*KSU-Lease* is based on the principle that the crop share lease is equitable to both parties, where "equitable" means the income generated from the crop land (e.g., crop production, government payments, crop insurance indemnities) is shared in the same proportion as the inputs are contributed by the parties involved in the lease. In other words, each party is compensated according to what he or she contributed to the production process. Defining a lease in this manner implies that shares going to each party need to change as relative contributions change, if the lease is to remain equitable. Thus, as producers adopt new technologies (e.g., no-till, center-pivot irrigation, non-traditional crops), presumably to increase returns, it is important to review the relative contributions to ensure that the lease remains equitable.

The first step in determining the terms of an equitable crop share lease is to identify all contributions to

[1] More recent surveys (Golden, Tsoodle, and Bigge, 2003; Tsoodle and Wilson, 2000) have reported a lower percent of farms that lease cropland, 54% and 67%, respectively. These survey results were based on a broader sample of farms that included more small and part-time farms. Thus, the older survey from KFMA is reported here as it likely is a more accurate representation of commercial farms current practices.

the production process made by the landowner and the tenant.[2] In *KSU-Lease*, the "tab" labeled **Crop budgets** represents the section in the spreadsheet where all cost and return information for up to six crops is entered. The information represented in this section should represent total costs for both the landowner and operator. This section follows the format of the K-State Farm Management Guides (projected crop budgets) so users may want to refer to these budgets for cost and return information. These budgets can be accessed at the K-State Agricultural Economics website (www.agmanager.info).

## Inputs Required for *KSU-Lease*

The following is a brief explanation of the different inputs required in the spreadsheet. Cells for inputs are shaded (light blue) and identified with blue text. Outputs, or calculated values, are represented with black text. Some input costs are entered directly in the Budget; others are entered in either Table 1 or Table 2 located directly below the crop budget section in the spreadsheet. Unless otherwise noted, all income and cost variables should be entered on a ***per planted acre basis***.

**Crop/System** – up to six different crops can be considered at one time in the *KSU-Lease* spreadsheet (columns D through I).

**Planted acres of each crop** (Budget) – acres typically planted to each crop in the rotation.

**Tillable acres per planted acre** (Budget) – tillable acres per planted acres represents the land use intensity. With continuous cropping this value = 1.0, but for fallow situations it will be greater than 1.0 (e.g., wheat-fallow = 2.0 and wheat-corn-fallow = 1.5). With double cropping this value will be less than 1.0 (e.g., wheat-double crop soybeans = 0.5 for both crops or 1.0 for the wheat and 0.0 for the soybeans). Total tillable acres represents the basis for the lease analysis and should match up with the total tillable acres in the lease. Note that with fallow acres, total tillable acres will be greater than total planted acres; whereas, with double-cropping total planted acres will be greater than total tillable acres.

**Income per acre** – because equitable crop share leases are based on relative contributions (i.e., costs), income per acre does not directly impact crop share percentages, however, this information is required for determining cash rents.

***Yield per acre*** (Budget) – expected yield over the lease period.
***Price per unit*** (Budget) – expected price per unit ($ per bu or ton etc.) over the lease period.
***Net government payments*** (Budget) – expected government payment.
***Indemnity payments*** (Budget) – expected crop insurance payments (enter if premiums are entered as a cost).
***Miscellaneous income*** (Budget) – other income that is part of the lease (e.g., wheat grazing, crop aftermath).

**Costs per acre** – costs per planted acre should represent expected average costs over the lease period.

***Seed*** (Table 1) – enter seeding rate/acre and cost per unit (make sure rate in "rate/acre" and cost in "cost/unit" are the same units (e.g., 1,000 seeds/acre and $/1,000 seeds or lbs/acre and $/lb). For

[2] In this paper, the words landowner and landlord are used interchangeably to represent the party owning the land (lessor). Likewise, the words tenant, operator, and producer are used interchangeably to represent the party that is farming the land (leasee).

perennials (e.g., alfalfa), enter the annualized cost over the lease period. If the seed cost includes a technology fee or additive/treatment (e.g., Roundup Ready soybeans, Bt corn, Gaucho) that is treated differently in the crop share arrangement than the seed cost, this cost should be entered separately. For example, if the landlord shares insecticide costs but not seed cost, then the portion of the seed cost that replaces any insecticide should be entered as an insecticide (i.e., Gaucho, or the technology fee associated with Bt, should be entered as an insecticide not as seed).

***Herbicide*** (Table 1) – rates and prices for up to ten herbicides can be entered (make sure rate and cost units match). For tank mixes where the cost/acre is known, enter the rate as 1 and the $/unit as the per acre cost.

***Insecticide / Fungicide*** (Table 1) – rates and prices for up to four insecticides/fungicides can be entered (make sure rate and cost units match).

***Fertilizer*** (Table 1) – annual rates and prices of up to five different fertilizer products can be entered (make sure rate and cost units match). For fertilizer that is not applied annually (e.g., lime), enter the annualized cost over the lease period.

***Irrigation water, inches/acre*** (Table 1) – expected inches of irrigation water applied and the cost per acre-inch. If non-irrigated land, enter zero.

***Irrigation repairs, $/acre-inch*** (Table 1) – expected repairs for irrigation equipment on a per acre-inch basis. If non-irrigated land, enter zero.

***Drying cost, $/unit*** (Table 1) – expected cost of drying grain on a per unit of yield basis (make sure drying cost and yield per acre units match, e.g., bu, cwt). If selling price entered on line B in income section is net of drying costs, then enter zero for drying cost.

***Crop consulting*** (Budget) – cost for crop consultant(s) if that service is considered.

***Crop insurance*** (Budget) – enter cost for crop insurance if an expected indemnity payment was entered on line D in income section. On average, if expected indemnity payments equal expected crop insurance premiums, then both of these categories can be left blank as they offset each other. Historically, crop insurance premiums have been less than indemnity payments due to the government subsidy for a number of crops.

***Miscellaneous*** (Budget) – enter miscellaneous cost (this typically includes farm dues, fees, subscriptions, etc. that have not been included in any other category).

***Machinery expense*** (Table 2) – machinery expenses are entered using the total number of field operations (e.g., planting, tillage, spraying, harvest) and the cost per acre for each operation. An estimate of machinery cost per acre often used is market custom rates. Custom rates for most field operations in Kansas are reported by Kansas Ag Statistics (see http://www.nass.usda.gov/ks/). Research has estimated that custom rates underestimate the total costs to own and operate machinery by 25-30 percent (Beaton, Dhuyvetter, and Kastens), thus an estimate for the cost per acre for each operation would be the reported custom rate times 1.25. Harvesting cost can be entered as an amount per acre, an amount per bushel, or a combination of the two.

***Non-machinery labor*** (Table 2) – non-machinery labor (hours and $/hour) are included to capture labor costs that may not be accounted for using machinery custom rates (e.g., time spent checking fields, marketing). Research indicates that non-machinery labor costs have averaged 11-13 percent of machinery costs. On a doller-per-acre basis, non-machinery costs are estimated to range from $5.50 to $11.50 and average approximately $8.25 for nonirrigated crops in Kansas.

***Irrigation*** – irrigation cost includes depreciation, interest, repairs, labor, and pumping cost. Repairs and pumping cost information is entered in Table 1 (see discussion above) and investment and labor information is entered in Table 2. Enter hours per acre and $/hour for irrigation labor. Enter total investment for the well, pump and gearhead, power unit and meter, and delivery system on a new

equipment basis. Enter the years to depreciate the irrigation equipment over and salvage value (percent of new investment) at the end of that time. Values entered for investment, years, salvage value, and interest on capital are used to calculate depreciation and interest charges. Depreciation and interest costs are allocated to the different crops based on both acres irrigated and inches of water applied.

***Land charge*** (Table 2) – enter an average value of land ($/tillable acre) and an annual rate of return in Table 2. Based on cash rents and land values reported by Kansas Agricultural Statistics, the rent-to-value ratio has historically been 5.5 to 6.5 percent for crop land in Kansas. Thus, enter 5.5 to 6.5% in the $/unit cell for the land cost.

***Interest on nonland costs*** – interest on nonland costs is calculated based on the interest on capital rate entered in Table 2 times one-half of all costs (line G) less the land charge and drying cost. It is recommended to enter the typical rate on operating loans at banks in the interest on capital cell.

Income, expenses, and returns over costs in the crop budgets tab are reported for the farm (total) and on a per planted and per tillable acre basis. Total costs per unit and the rate of return to total costs are calculated for each crop. Although these measures are included for comparison purposes and management decisions, they have no direct impact on crop share leases. The crop budgets as well as Tables 1 and 2 can be printed by clicking on the "Print budgets" and "Print tables" buttons. Alternatively, the Excel print features can be used to manually print selected ranges.

The second step, after all contributions (costs) have been determined, is to identify who is responsible for each of the expenses. This is done in the "tab" labeled **Shares** of the *KSU-Lease* spreadsheet. Relevant information for the landowner and the operator (name, address, phone number, etc.) and the basis for the equitable shares calculations also are entered in this section. The basis for the equitable shares calculations can either be the entire rotation or crop-by-crop by entering either 0 or 1 in cell L4, respectively. By choosing the entire rotation (L4=0), the spreadsheet will determine the equitable shares for both the landowner and tenant based on contributions and then assign that same percent to all crops (income and equitably shared inputs). That is, despite how costs might be assigned for each crop, setting L4=0 means that the landlord's percent share of income (and equitably shared inputs) will be the same for all crops in the rotation. On the other hand, if crop-by-crop (L4=1) is chosen, the spreadsheet will assign a unique equitable share percent to each crop individually, meaning that the landlord would receive a different percent share of income for each crop.

Although the ability of *KSU-Lease* to consider equitable shares on a crop-by-crop basis (L4 = 1) is a powerful feature, that feature should be used cautiously. In particular, given that crop production has substantial agronomic and economic interactions among crops in a rotation, reported income, cost, and profit could be reasonably accurate when calculated across the whole rotation, but highly inaccurate when calculated on a crop-specific basis. For example, one crop in a western Kansas rotation of wheat-corn-fallow might be reported to be more profitable than the other, implying only that crop should be grown, yet that crop's success might depend in large part on the rotation of which it is a part. Double-crop soybeans is another example. Although economic profits for all crops are expected to be 0 in the long run, observed values in a particular application of *KSU-Lease* might depart from 0. Thus, one crop might show a positive profit and another negative. In that case, the incentive for either the landlord or the tenant is to want to be responsible for all costs on the profitable crop and no costs on the unprofitable one. Such skewed incentives likely will be counterproductive in the long run. To avoid that problem, lease parties might a) consider a lease that is less crop-specific (i.e., keep L4 = 0), or b)

adjust costs among crops so that expected profits are similar across crops.

For each expense listed in the crop budget, the OPERATOR's share is entered as a percentage. For expenses that are totally the responsibility of the operator, enter 100%. If the expense is totally the landowner's responsibility, enter 0%. Other shares can be entered as needed. However, for shared expenses (e.g., fertilizer), it is recommended to enter the percentage as -100%. Entering -100% simply means that particular input is to be shared in the same percentage as the income, which is what *KSU-Lease* computes – the equitable crop share percentages. The reason it is recommended to share many inputs (especially yield increasing inputs such as fertilizer) in the same percentage as the crop income is that this provides both parties to the lease the economic signals for optimal input use. For example, a tenant who pays for 100% of the fertilizer but receives only 67% of the crop may have an incentive to under fertilizer, causing both the landlord and the tenant to be less profitable than they otherwise would be. However, *KSU-Lease* is adaptable and does allow users to enter some predetermined percentage to share inputs. This adaptability allows crop inputs to be shared many different ways. For example, inputs can be entered such that the operator's share of burn-down herbicides is 100%, but only 67% of other herbicides. Yet, for the same crop, fertilizer might be shared "equitably" (i.e., -100% entered).[3]

By entering the operator's share for each input, the landowner's share is calculated as 100% minus the operator's share. Thus, *KSU-Lease* assumes there are only two parties to the lease because each cost is allocated to the operator, the landowner, or some combination of the two. In addition to entering the operator's share for each input of each crop, there is a line to enter a direct cash payment ($/acre) from the operator to the landowner. This line will almost always be left zero because cash payments are seldom a part of crop share leases. Example scenarios where this line might be used are as follows. If a predetermined share is desired on both income and certain inputs, a cash transfer (positive or negative) may be required to make the lease equitable. Or, if a lease is a combination of crop share and cash (i.e., the tenant pays a low cash rent but the landowner also receives a share of the crop), the cash amount might be included here. After all values have been entered, the tables showing the operator's shares (OS%) can be printed by clicking on the "Print operator's shares" button.

After these first two steps are completed, that is, all costs and the parties responsible for them are identified, the equitable crop share percentages of the operator (OS%) and the landowner (100-OS%) are known. In *KSU-Lease*, the "tab" labeled **Lease budgets** reports the crop share budgets for both the operator and the landowner where income and any equitably shared inputs (i.e., those entered with a -100%) are split according to the ES% reported at the top of the budget. The returns over total costs (i.e., profit) will be shared in the same proportion as the income. Thus, if the **Crop budgets** section showed a profit of $5 per planted acre, that $5 will be split as OS% going to the operator and (100-OS%) going to the landowner. In short, the operator covers OS% of the total costs, gets OS% of the total income, and OS% of the profit. And, the landowner covers (100-OS%) of the costs, gets (100-OS%) of the income, and (100-OS%) of the profit. The operator and landowner equitable crop share budgets can be printed by clicking on the "Print budgets" button.

[3] This is an example for illustrative purposes only to show the adaptability of *KSU-Lease* and should not be considered a recommendation as to how certain inputs should be shared.

## Determining Cash Rental Rates

Historically, cash renting has been much less common than renting on a crop share basis; however, recently the interest in cash rent has been increasing. Thus, many landowners and operators seek information to help select appropriate cash rental rates for their situations. In areas where there is sufficient cash renting, the prevailing cash rent market price provides an approximation of the appropriate cash rent. However, in some situations there is no established rental rate or, if there is one, the rate has extenuating circumstances that preclude it from being appropriate (e.g., rate includes buildings or machinery; or rent is between family members). In these cases, one or more of the following three methods might be used to determine a starting point for negotiation between the landowner and producer: (1) landowner's cost, (2) crop share adjusted for risk, and (3) amount tenant can afford to pay.

### *Landowner's Cost Method*

Like many investments, the total annual return to crop land can be divided between a cash return (dollar amount of cash or cash-equivalents received each year, less real estate taxes) and a capital gain return (dollar amount of appreciation in value each year). For convenience, these returns can be expressed as a percent of land value (e.g., 5.5% cash, 4.0% gain, and 9.5% total). As used here, the relevant landowner cost is only the cash return because the landowner acquires the capital gain return outside of the lease. The landowner's cost can be approximated by the historical average rent-to-value ratio. Using this method, the cash rent would be calculated by multiplying the rent-to-value ratio by the market value of the land.[4] As previously discussed, the historical rent-to-value ratio for Kansas crop land has been between 5.5 and 6.5 percent.

### *Crop Share Adjusted for Risk Method*

Because most landowners and tenants are familiar with crop share arrangements, using a crop share approach to determine a cash rental rate is appropriate and understandable. This approach determines the cash equivalent amount of an equitable crop share arrangement and then 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, with crop share this risk is shared between the producer and the landowner. A "risk adjustment factor" of 1 to 5 percent is typically recommended. For example, after calculating the cash equivalent of an equitable crop share, this dollar amount should be reduced by some percent (e.g., 3%) to account for the fact that the landowner has no yield or price risk.

### *Amount Tenant Can Afford to Pay Method*

The "amount a tenant can afford to pay" method of establishing cash rents says that the tenant receives all income and pays all expenses and whatever is left is available for cash rent to the landowner. This "residual" approach considers how much (or little) can be paid for land given the income and production expenses.

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[4] The historical rent-to-value ratio times market land value is only appropriate when the market value represents agriculture uses. That is, as land values increase due to non-ag uses, the historical rent-to-value ratio will not be appropriate. For a more detailed discussion of land values, returns to land, and non-ag considerations, see *Valuing and Buying Farmland, with a Consideration of Non-Ag Features* available at the www.agmanager.info website.

*KSU-Lease* calculates cash rents for each of these three methods based on the inputs in the crop budgets section (the only additional input required is the risk adjustment factor). As previously stated, the "going market rate" for cash rents is the most relevant number when available. However, the values calculated in *KSU-Lease* can be useful as landowners and producers negotiate cash rents for their particular situations. Calculated cash rents are reported for the farm (total) and on a per planted and per tillable acre basis. The cash rent information can be printed by clicking on the "Print cash rent info" button.

## Summary

*KSU-Lease* is based on the principle of crop share leases being equitable. That is, income is shared in the same proportion as contributions of expenses. This program is intended to serve as a tool for landowners and their tenants as they negotiate lease terms. While this spreadsheet allows for considerable flexibility in how landowners and producers share (or don't share) individual expenses, and can accommodate most scenarios, it is important to recognize that it is not a substitute for good communications between landowners and their tenants.

## References


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