DEPARTMENT OF AGRICULTURAL ECONOMICS

Determining Cropland Share Rental Arrangements

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Crop producers in Kansas and Texas rely heavily on rented land in their farming operations. In a 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. Because rented land is so important in the majority of 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.

Rental arrangements often appear unresponsive to changes in production practices, and generally slow to change over time. Producers generally work with multiple landowners and may be reluctant to change rental arrangements with any one landowner unless changes can be made with them all. Additionally, rental arrangements may be slow to change because land is often rented from the same landowner for an extended time and the parties involved may feel the costs of renegotiating rental arrangements on a regular basis outweigh the benefits.

Crop land is typically rented in one of three ways: (1) cash rent, (2) crop share, or (3) cash/share combination. This publication focuses on determining crop share rental arrangements. Related publications in this series focus on cash rental arrangements and land values.

Determining crop shares

Producers often struggle with establishing terms for crop share rental arrangements. Economic theory says that equilibrium rates occur where supply of land equates with demand for land. Thus, the question arises, How do we arrive at an equilibrium price? Typically, landowners and tenants resort to some sort of negotiation and claim to want a crop share lease arrangement that is "fair" and equitable to both parties.

The concept of an equitable crop share arrangement is to identify all contributions made separately by a landowner and a tenant and then share any income in this same proportion. In other words, each party is compensated according to what he/she contributed to the production process. The underlying assumption of an equitable lease is that returns to land are similar to the returns to non-land inputs. Defining a lease as "fair" and equitable in this manner implies that shares going to each party need to change as relative contributions change, if the lease is to remain equitable.

Principles of Crop Share Leases

A good crop share lease should follow five basic principles (Langemeier): (1) yield increasing inputs should be shared, (2) share arrangements should be adjusted as technology changes, (3) total returns are divided in the same proportion as resources contributed, (4) compensation for long-term investments at termination, and (5) good landowner/tenant communications.

While all inputs are yield increasing (e.g., without seed there is no yield), principle #1 refers to inputs where yield is a continuous function of the use of the input. Examples of yield increasing inputs are fertilizer, irrigation water, possibly herbicides in semiarid regions, and possibly hybrid seed. The optimal amount of an input to use is when the value of an additional unit of input equals the cost of supplying an additional unit. In economic language, this is referred to as the point where the value of marginal product (VMP) equals the marginal input cost (MIC).

Figure 1

					Income and cost position of tenant			
Units /acre	**Yield (bu)**	**Income $2.25/BU**	**VMP**	**MIC**	**All inc. all cost**	**2/3 inc. all cost**	**2/3 inc. no cost**	**2/3 inc. 2/3 cost**
0	35	$78.75			$78.75	$52.50	$52.50	$52.50
20	55	$123.75	$45.00	$8.00	$115.75	$74.50	$82.50	$77.17
40	68	$153.00	$29.25	$8.00	$137.00	$86.00	$102.00	$91.33
60	73	$164.25	$11.25	$8.00	$140.25	$85.50	$109.50	$93.50
80	74	$166.50	$2.25	$8.00	$134.50	$79.00	$111.00	$89.67
100	75	$168.75	$2.25	$8.00	$128.75	$72.50	$112.50	$85.83

Figure 1 shows optimal fertilizer application rates across alternative cost/income sharing arrangements. In this example, VMP is greater than MIC at 60 units of fertilizer but less at 80 units, so total returns to fertilizer are maximized at 60 units. To determine the optimal amount of fertilizer a tenant would apply, VMP and MIC need to be adjusted to reflect the appropriate percentages. When the cost of the yield increasing input is not shared by the landowner (2/3 inc.- all cost column), the tenant has an economic incentive to under fertilize and hence reduce total returns (returns to both landowner and tenant). Similarly, if the tenant pays none of the cost (2/3 inc.- no cost), he has an incentive to over fertilize which also decreases total returns. When the cost of fertilizer is shared in the same proportion as the income (2/3 inc.- 2/3 cost) the tenant maximizes his returns at the same level of fertilizer that maximizes total returns.

Because fertilizer is a relatively low-cost input, sharing it in the same percent as income may not be critical. As the relative cost of the yield increasing input increases it becomes more important to share the input because the economic incentive for the tenant to use either too little, or too much, of the input becomes greater. Thus, principle #1 helps to promote optimal production management.

Principle #2 simply states that technologies may affect share arrangements as they may change the relative contributions of the parties involved. Examples of technological changes are reduced or no-till, new crops and/or rotations, center pivot irrigation, hybrid seed, biotechnology, and precision ag (GPS).

A specific example of a technological change is the increased adoption of the wheat-sorghum-fallow rotation in western Kansas. Figure 2 shows how the relative contributions change for the landowner and tenant by moving from a wheat-fallow (WF) to a wheat-sorghum fallow (WSF) rotation based on a study conducted at Garden City, Kansas. With the WF rotation, the equitable crop share arrangement is 1/3 - 2/3 (landowner 1/3 and tenant 2/3) with the tenant paying for all herbicide. However, with the WSF rotation, if the tenant continues to pay all herbicide expense, the equitable arrangement would be a 30%/ 70% split. If the traditional 1/3 - 2/3 crop share is desired, it can be derived by having the landowner share the sorghum herbicide expense.

Figure 2

	WF	**WSF**	**WSF**
Land	Landlord	Landlord	Landlord
Machinery	Tenant	Tenant	Tenant
Fertilizer	Shared	Shared	Shared
Herbicide*			
Wheat	Tenant	Tenant	Tenant
Sorghum		Tenant	Shared
Other operating	Tenant	Tenant	Tenant
Contributions	**33.3/66.7**	**30.5/69.5**	**33.1/66.9**

*Herbicide expense only, application charge is included in other operating.

In this example (figure 2), it worked out that the landowner would need to pay 1/3 of the sorghum herbicides in order to maintain the 1/3 - 2/3 crop share arrangement. However, it may be that paying some other percentage of the herbicides would be appropriate in other cases. For example, if herbicide expense on the sorghum were higher, it may be that the landowner would only need to pay 1/4 of the sorghum herbicide costs to maintain a 1/3 - 2/3 equitable split between total costs and income.

How a lease is structured before the adoption of a new technology should also be considered. Figure 3 compares the equitable crop share percentages of going from conventional till to no-tillage in north central

Figure 3.

Conventional (CT) vs. No-tillage (NT) Effect on Equitable Shares (60% wheat, 20% sorghum, 10% soybeans, 10% corn rotation)				
Tillage System	CT	NT	CT	NT
Contribution	Contributor		Contributor	
Land	Landlord	Landlord	Landlord	Landlord
Machinery	Tenant	Tenant	Tenant	Tenant
Fertilizer/insecticide	Shared	Shared	Shared	Shared
Herbicide and application	Tenant	Tenant	Shared	Shared
Other	Tenant	Tenant	Tenant	Tenant
Contributions	**32.4/67.6**	**33.6/66.4**	**37.6/62.4**	**43.8/56.2**

Kansas under two different scenarios. In the first scenario, the landowner only shares fertilizer and the equitable arrangement is approximately 1/3 - 2/3 . In this case, switching to no-till has little impact on the equitable crop share percentages because herbicide is essentially a substitution for tillage. However, if the landowner is initially sharing all herbicides and application costs (last two columns), switching to no-till increases the equitable share for the landowner (44% compared to 38%), as he is now contributing a larger share of total inputs.

Figures 2 and 3 demonstrate that the impacts new technologies have on equitable crop share arrangements will vary due to a number of factors (e.g., geographic region, specific technology being adopted, inputs shared initially). It is also shown that the adoption of a new technology may increase, decrease, or have no effect on the equitable crop share percentage for either the landowner or the producer. Therefore, generalizations about the impact of new technologies on crop share arrangements are not always possible. Because of this, the impact new technologies have on equitable shares may need to be analyzed on a case-by-case basis. It is important that lease arrangements are flexible enough to accommodate changing technologies.

Principle #3 states that total returns should be divided in the same proportion as resources contributed, which is basically how a "fair" and equitable

Figure 4.

Land and Machinery Ownership Costs		Landlord Share*	Annual Charge	Landlord	Tenant
Total acres (include fallow)	812	100%			
Value of land/acre	$650	-			
Rate of return	6.0%	-	$39.00	$39.00	$0.00
Taxes/acre (0.50%)	$3.25	-	$3.25	$3.25	$0.00
Machinery inv/planted acre	$238	0%			
Salvage value-percent	35.0%				
Depreciation-years	10	-	$15.47	$0.00	$15.47
Rate of return	9.0%	-	$14.46	$0.00	$14.46
Repairs/acre	$15.40	0%	$14.69	$0.00	$14.69
Management charge	0.0%	25%			
Total value of assets	$888		$0.00	$0.00	$0.00
TOTAL OWNERSHIP COST/LEASED ACRE			$86.86	$42.25	$44.61
Cash payments between parties (total $)			$0	$0	$0

**Landlord share of -100% implies input is shared in same proportion as income.*

Figure 5.

Operating Costs Sorghum	Landlord Share*	Annual Charge	Landlord	Tenant
Labor (hrs) 2.15	0%	$23.22	$0.00	$23.22
Seed	0%	$3.15	$0.00	$3.15
Herbicide	-100%	$20.15	$6.72	$13.43
Insecticide	-100%	$4.35	$1.45	$2.90
Fertilizer	-100%	$23.10	$7.70	$15.40
Fuel and oil	0%	$7.10	$0.00	$7.10
Irrigation energy	0%	$0.00	$0.00	$0.00
Crop consulting	0%	$0.00	$0.00	$0.00
Custom harvest & hauling	0%	$0.00	$0.00	$0.00
Miscellaneous	0%	$0.00	$0.00	$0.00
_____	0%	$0.00	$0.00	$0.00
_____	0%	$0.00	$0.00	$0.00
Interest on operating		$3.65	$0.71	$2.93
TOTAL OPERATING COST/ACRE		$84.72	$16.58	$68.13

**Landlord share of -100% implies input is shared in same proportion as income.*

lease is defined. In order to identify what is contributed by each party, some type of budgeting process is required to account for all costs. Perhaps the most difficult part of this process is determining the annual contributions for capital assets such as land, machinery, or irrigation equipment.

The annual land contribution is typically based on an average market value of land times some historical return to land. Machinery costs can be based on either an average investment or custom rates approach. With the investment approach, annual machinery costs to include are market (not tax) depreciation, interest, insurance, fuel and oil, and labor. The annual machinery contribution should be based on average machinery costs and not on specific costs of the party providing the machinery. The reason for this is that producers should not be penalized for having below average machinery cost, which is what would happen using an individual's actual costs along with the contribution approach. Likewise, a producer who has high machinery costs due to his/her inefficiencies or management should not benefit from these high costs by getting a higher share of the crop. Figure 4 shows an example of

Figure 6.

Total Costs and Contributions				
OPERATING COSTS PER PLANTED ACRE (excluding labor)				
Crop	Acres	Total	Landlord	Tenant
Wheat	460	$44.60	$7.69	$36.91
Sorghum	211	$61.51	$16.59	$44.92
Soybean	141	$61.66	$12.72	$48.93
Total for Farm	812	$42,190	$8,831	$33,359
OWNERSHIP COSTS (including labor and management)		$87,173	$34,307	$52,866
Cash payments between parties (total $)		$0	$0	$0
TOTAL COSTS (adjusted for cash payment)		$129,363	$43,138	$86,225
Operating costs per leased acre		$51.96	$10.88	$41.08
Ownership costs per leased acre		$107.36	$42.25	$65.11
TOTAL COSTS PER LEASED ACRE		$159.31	$53.13	$106.19
PERCENT CONTRIBUTED →		100.0%	33.3%	66.7%

how the land and machinery contributions are considered, where the machinery costs are based on an average investment per acre.

Production inputs such as seed, herbicides, etc. are typically valued at current values. Figure 5 shows an example of the production inputs, where insecticide and fertilizer are shared equitably (i.e., in the same proportion as income).

Figure 6 shows the total costs provided by both parties as well as the percent contributions, where this percentage represents how income and equitably shared expenses would be split.

If the objective of a crop share arrangement is to have a "fair" and equitable lease where both parties are compensated according to their relative contributions, then whether certain inputs are shared, or not shared, is not an issue (except as it applies to principle #1). Rather, what is important is that whoever pays for the input is compensated accordingly by adjusting the crop shares when necessary.

If landowners and tenants have preconceptions about which inputs should be shared, the actual amounts are then determined by the "fair" process, which simultaneously selects crop shares. On the other hand, if there are preconceptions about what crop shares should be, different items might be cost shared at different levels to make the "fair" process happen. In other words, crop share leases based on this "fair" and equitable concept can be developed based on either a predetermined share rate (e.g., 33/67, 40/60, 50/50) or a predetermined mixture of which inputs are shared (e.g., fertilizer and insecticide) but not both as a general rule.

Principle #4 simply states that if a tenant pays for any long term inputs (e.g., lime, alfalfa seed) he/she should be compensated for any unused portion of that investment when the lease is terminated. This would hold true whether the lease is a crop share or cash lease, and whether the input was paid entirely by the tenant or whether it was shared with the landowner.

Principle #5 says that a good lease is based on good communications between the landowner and the tenant. Regardless of whether the lease is cash rent or crop share, good communications and trust between the landowner and producer are more important than any other factor if the goal is to have a long term arrangement that is in the best interest of both parties. It is especially important that landowners and tenants maintain good communication as production practices change so that rental arrangements can be evaluated and revised as economic conditions dictate.

References

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