

**Equitable Cropshare Arrangements for Intensive  
Dryland Cropping Systems**

By

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## **Abstract**

As producers move toward intensive dryland cropping systems, the potential for inequities in cropshare lease arrangements exists. A whole farm budget was developed to evaluate returns for landowner and tenant from different cropshare lease arrangements. Results suggest that cropshare lease adjustments are necessary as cropping systems become more intensive.

## **Equitable Cropshare Arrangements for Intensive Dryland Cropping Systems**

Recent changes in agriculture policy and concerns about crop prices have increased incentives to change from traditional wheat fallow rotations to more intensive cropping systems. Although cropping systems are changing, cropshare lease arrangements have been slow to follow (Nitchie, 1996). With the changes in production practices and cropping systems, an imbalance of costs, returns, and risk has become apparent. This imbalance has created a need for a process to determine the fair and equitable cropshare lease rates for more intensive dryland crop systems. Adjustments to traditional cropshare lease arrangements may be necessary to maintain an equitable agreement between landowners and cropshare tenants.

Presently 47 percent of the agricultural land in Nebraska is leased each year, and cropshare leasing is the primary leasing arrangement throughout most of the state for the crop acres (Johnson, et al., 1998). In addition, dryland crop acreage in the northwest region of Nebraska is nearly exclusively leased on a cropshare basis. The standard cropshare percentage arrangement in the area is a  $\frac{2}{3}$  -  $\frac{1}{3}$  tenant-landowner share comprising over 75 percent of the lease arrangements in 1996 (Johnson, et al., 1998). Some change toward other arrangements is occurring, although adjustments are slow. As recently as 1986, over 90 percent of the cropshare arrangements were a  $\frac{2}{3}$  -  $\frac{1}{3}$  tenant-landowner share agreement (Johnson and Lundeen, 1987). Much of the movement has been toward a  $\frac{3}{4}$  -  $\frac{1}{4}$  tenant-landowner share with an increase from 2 percent of the arrangements in 1986 (Johnson and Lundeen, 1987) to 10 percent in 1996 (Johnson, et al.,

1998). The increase in  $3/4 - 1/4$  tenant-landowner share arrangements reflects the number of dryland crop acres that are being converted to more intensive crop rotations.

Historically, the return on investment for land, machinery, and operating costs, as well as return to management, have been residual claimants on the farming operation. Although these are residual claimants, for budgeting purposes frequently the returns have been designated using some predetermined capitalization rate. However, in practice the tenant and landowner pay all cash obligations, then evaluate the remaining cash to determine the actual return on investment. The objective of this study is to determine the return on investment for both tenant and landlord in a dryland cropshare agreement. The return on investment will be determined for the traditional wheat-fallow rotation with a  $2/3 - 1/3$  share and for more intensive crop rotations with alternative share agreements. Inequities that may occur under different production systems and share agreements will be presented.

### Procedure

Return to the landowner is a limiting factor in considering the proper cropshare percentage and the ability of the tenant to meet the income expectations of the landowner. A whole farm budget was developed to evaluate return to investment and management for both the landowner and tenant using a spreadsheet that allows for different crop rotations and adjustments to the cropshare lease percentages (Figure 1). The landowner's investment in crop production includes land and any operating costs that are shared with the tenant. The investment for the tenant includes machinery and operating costs required

Figure 1. Example of abbreviated whole farm budget spreadsheet used to compute returns on investment and management for landowner and tenant farmer.

Crops Included	Acres	Investment Value		Projected			
		Land	Machinery	Yield	Price		
		\$/Acre	\$/Acre				
Wheat	600.00	385.00	235.34	35	\$3.15		
Proso Millet	600.00	385.00	164.74	20	\$5.34		
Fallow	600.00	385.00					

  

Description	Whole Farm Costs						
	Wheat	Millet	Wheat	Millet	Total	Landowner	Tenant
	\$/Acre	\$/Acre	Cost	Cost	Cost	25.00%	75.00%
Total Variable Costs	40.52	49.46	24,312.00	29,676.00	53,988.00	2,190.00	51,798.00
Total Fixed Costs	30.71	24.99	18,424.50	14,992.50	33,417.00	12,285.00	21,132.00
Total of All Costs	71.23	74.45	42,736.50	44,668.50	87,405.00	14,475.00	72,930.00
Projected Gross Returns	110.25	106.80	66,150.00	64,080.00	130,230.00	32,557.50	97,672.50
Government Payments	9.47	9.47	5,682.00	5,682.00	11,364.00	2,841.00	8,523.00
Projected Net Returns	48.49	41.82	29,095.50	25,093.50	54,189.00	20,923.50	33,265.50
Return to Total Investment and Management Costs					5.49%		
Return to Land and Management Costs (Landowner)					3.01%		
Return to Operating, Machinery, and Management Costs (Tenant)					11.40%		

for growing the crops. The 1999 Nebraska Crop Budgets are the basis for development of the whole farm model. Separate budgets were used for each of the crops in the possible intensive rotation schedules (proso millet, sunflowers, corn) and for the traditional wheat-fallow rotation. These budgets were then combined in the proper proportion to develop the whole farm budget based on 1,800 acres of tillable land with 900 acres in wheat and 900 acres fallow in the traditional wheat-fallow rotation. The three more intensive cropping systems evaluated were all two crops in three years rotations with wheat in 1/3 of the crop land; corn, sunflowers, or dryland corn in 1/3 of the crop land; and 1/3 of the

crop land to remain in fallow. Acres in crop and fallow are adjusted for each rotation system as necessary to match rotational requirements. Baseline calculations were developed using five-year average yields and prices for the Nebraska Panhandle. The five-year average prices are: wheat, \$3.15 per bushel; proso millet, \$5.34 per cwt; sunflowers, \$11.14 per cwt; and corn, \$2.70 per bushel. The corresponding five-year average yields are: wheat, 35 bushels per acre; proso millet, 20 cwt per acre; sunflowers, 10 cwt per acre; and corn, 45 bushels per acre. The 1998 average dryland crop value as published (Johnson, 1998) is \$385.00 per acre for the Nebraska Panhandle. Present land prices are used for this study to accurately estimate return on investment in relation to other presently available market investment opportunities for the landowner. Upon completion of the baseline annual return from a wheat-fallow system on 2/3 - 1/3 cropshare arrangement, the whole farm model was used to estimate the projected annual return for the more intensive systems under a 2/3 - 1/3, a 3/4 - 1/4, and a 4/5 - 1/5 cropshare arrangement. From these calculations, an equitable cropshare arrangement was selected for each of the intensive cropping systems. Once the baseline budgets and the corresponding cropshare recommendations for the intensive systems were developed, sensitivity tables for changes in prices, yield levels, and land values were developed to provide explanations concerning the effects of changes in these variables.

### Results

The baseline wheat-fallow rotation with the 2/3 - 1/3 tenant-landowner cropshare arrangement is the most common in the Nebraska Panhandle (Johnson, et al., 1998). With

the widespread acceptance of the 2/3 - 1/3 cropshare arrangement for dryland wheat production in the area the 3.06 percent (Table 1) annual return to investment and management is a rate that landowners have been willing to accept. Under this same scenario, the return on investment and management for the tenant is 8.46 percent (Table 1). Table 1 shows that the annual returns for both the tenant and landowner for each of the cropshare arrangements. Using these return levels, the traditional wheat-fallow system under a 2/3 - 1/3 cropshare is equitable with the intensive crop systems at a 3/4 - 1/4 cropshare arrangement. The wheat-proso millet-fallow rotation shows projected annual returns to the landowner of 3.01 percent, and returns to the tenant of 11.40 percent (Table 1). The next most profitable rotation for the tenant is the wheat-sunflowers-fallow rotation with an annual return of 9.74 percent for the tenant and 3.11 percent for the landowner. The least profitable of all the rotations for both the landowner and tenant is the wheat-dryland corn-fallow system with returns of 2.91 percent and 6.51 percent, respectively. The tenant farmer will realize higher return to investment for the intensive crop systems (as much as three percent return on investment), however, the tenant must accept an increased risk and management requirement in changing from one crop in two years to two crops in three years. This return premium is the payment that the tenant may reasonably expect for accepting the additional risk and management required by the new cropping system.

These return levels will vary from year to year as changes in crop prices, crop yields, and land values occur in the marketplace. Each of these factors have a profound



effect on the return levels to both the landowner and tenant from each of the cropping systems. The differences in each of these values were evaluated using the recommended 2/3 - 1/3 cropshare arrangement for wheat-fallow and a 3/4 - 1/4 arrangement for each of the three intensive systems.

Table 1. Percent return to investment in land, machinery, operating cost, and management for selected crop rotations and cropshare lease arrangement options using average prices and yields with current (1998) land price.

Crop Rotation System	Cropshare Percent Options					
	2/3 - 1/3		3/4 - 1/4		4/5 - 1/5	
	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner
Wheat-Fallow	8.46%	3.06%	11.85%	1.86%	13.87%	1.13%
Wheat-Proso Millet-Fallow	7.63%	4.60%	11.40%	3.01%	13.65%	2.06%
Wheat-Sunflower-Fallow	6.47%	4.73%	9.74%	3.11%	11.70%	2.14%
Wheat-Dryland Corn-Fallow	3.15%	4.45%	6.51%	2.91%	8.51%	1.98%

Dryland crop land values for Northwest Nebraska have moved from a high of \$419.00 per acre in 1981 to a low of \$242.00 per acre in 1987. Present (1998) land value is \$385.00 per acre in the region, nearly 92 percent of the highest value. Although land prices have increased steadily over the past ten years, it is possible that land values may continue to increase or drop to lower values based on the value of production (crop prices and yields) over the next several years. Another concern with determining the return to land is consistency in how land is valued on the landowner's balance sheet. If land is

valued at the purchase price, the value used to determine the return on investment may vary significantly from farm to farm based on the purchase date. If a true return on investment is to be calculated, there is some basis for using present land values because the money could be diverted to other investments at this time and the present value should be equal to the expected sale price.

As land prices move to lower levels, the return on investment for the landowner will increase with no change in returns for the tenant. The return to investment for \$242.00 per acre land increases 1.75 percent over the return at present land prices (Table 2). At the lower land price, returns to the landowner range from 4.61 percent for the wheat-dryland corn-fallow rotation to 4.94 percent for the wheat-sunflower-fallow rotation. This return level is possible if land were purchased at historically low price levels, and is presently valued based on the purchase price.

The twenty-year high price for this land is \$419.00 per acre, only a small increase over the present value of \$385.00 per acre. With present prices at near record high price levels, there is little response seen by increasing land values to the historic high price level. Returns to landowner investment drop approximately 0.25 percent at the \$419.00 per acre price level with the highest return at 2.86 percent for the wheat-sunflower-fallow rotation, and the lowest return at 2.67 percent for the wheat-dryland corn-fallow rotation. In each case, the return on investment for the tenant remains constant.

Table 2. Sensitivity table of percent return to investment in land, machinery, operating cost, and management for selected crop rotations and cropshare lease arrangement options using average yields and prices but variable land values.

Crop Rotation System	Land Price					
	20-year low \$242/Acre		1998 Price \$385/Acre		20-year high \$419/Acre	
	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner
Wheat-Fallow (2/3 - 1/3 share)	8.46%	4.86%	8.46%	3.06%	8.46%	2.82%
Wheat-Proso Millet-Fallow (3/4 - 1/4 share)	11.40%	4.78%	11.40%	3.01%	11.40%	2.77%
Wheat-Sunflower-Fallow (3/4 - 1/4 share)	9.74%	4.94%	9.74%	3.11%	9.74%	2.86%
Wheat-Dryland Corn-Fallow (3/4 - 1/4 share)	6.51%	4.61%	6.51%	2.91%	6.51%	2.67%

Crop prices and yields will have significant effects on returns to both the landowner and the tenant. The returns to landowner tend to be more stable over significant changes in both prices and yields, while the returns to the tenant are much more volatile (Tables 3, 4, 5, & 6). This volatility from the tenant's perspective can be directly attributed a higher share of the production being sold by the tenant farmer. The lowest price and yield values for each rotation show that the return on investment for the tenant are as low as a negative 12 percent (Table 6). The lowest return on investment for the landowner is zero for the lowest price and lowest yield in a wheat-dryland corn-fallow

rotation (Table 6). The highest returns are in excess of 40 percent for the tenant, while the highest returns for the landowner are limited to just over 9 percent (Tables 3, 4, 5, & 6).

Table 3. Sensitivity table of percent return to investment in land, machinery, operating cost, and management for wheat-fallow rotation under a 1/3 landowner - 2/3 tenant cropshare lease arrangement.

		Wheat yield (bu/acre)							
		20		30		40		50	
Wheat price		Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner
\$2.00		-8.46%	0.03%	-3.73%	0.90%	0.98%	1.76%	5.67%	2.62%
\$3.00		-3.56%	0.90%	3.61%	2.19%	10.74%	3.48%	17.86%	4.78%
\$4.00		1.35%	1.76%	10.95%	3.48%	20.51%	5.21%	30.05%	6.93%
\$5.00		6.25%	2.62%	18.29%	4.78%	30.28%	6.93%	42.23%	9.09%

Table 4. Sensitivity table of percent return to investment in land, machinery, operating cost, and management for wheat-proso millet-fallow rotation under a 1/4 landowner - 3/4 tenant cropshare lease arrangement.

		Wheat and millet yields (35 bu/ac. wheat; 20 cwt/ac. millet averages)									
Crop prices		Avg. - 40%		Avg. - 20%		Average		Avg. + 20%		Avg. + 40%	
Wheat \$/bu	Millet \$/cwt	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner	Tenant	Land-owner
	4.00	-7.9%	0.3%	-3.4%	0.9%	1.1%	1.6%	5.5%	2.2%	9.9%	2.9%
2.00	5.00	-6.0%	0.5%	-0.9%	1.3%	4.1%	2.0%	9.2%	2.7%	14.2%	3.5%
	6.00	-4.2%	0.8%	1.6%	1.6%	7.2%	2.4%	12.9%	3.3%	18.5%	4.1%
	4.00	-3.0%	1.0%	3.1%	1.8%	9.2%	2.7%	15.2%	3.6%	21.2%	4.4%
3.50	5.00	-1.1%	1.2%	5.6%	2.2%	12.2%	3.1%	18.9%	4.1%	25.5%	5.1%
	6.00	0.7%	1.5%	8.0%	2.5%	15.3%	3.6%	22.6%	4.6%	29.8%	5.7%
	4.00	1.9%	1.6%	9.6%	2.7%	17.3%	3.8%	24.9%	4.9%	32.5%	6.0%
5.00	5.00	3.7%	1.9%	12.1%	3.1%	20.3%	4.3%	28.6%	5.5%	36.8%	6.6%
	6.00	5.6%	2.2%	14.5%	3.4%	23.4%	4.7%	32.3%	6.0%	41.1%	7.2%

Table 5. Sensitivity table of percent return to investment in land, machinery, operating cost, and management for wheat-sunflower-fallow rotation under a 1/4 landowner - 3/4 tenant cropshare lease arrangement.

Crop prices		Wheat and sunflower yields (35 bu/ac. wheat; 10 cwt/ac. sunflower averages)									
		Avg. - 40%		Avg. - 20%		Average		Avg. + 20%		Avg. + 40%	
		Wheat	Sun-flower	Land-tenant	Land-owner	Land-tenant	Land-owner	Land-tenant	Land-owner	Land-tenant	Land-owner
	9.00	-6.5%	0.4%	-2.4%	1.1%	1.7%	1.8%	5.7%	2.5%	9.8%	3.2%
2.00	11.00	-4.6%	0.7%	-0.3%	1.4%	4.3%	2.2%	8.9%	3.0%	13.5%	3.8%
	13.00	-3.4%	0.9%	1.8%	1.8%	6.9%	2.6%	12.0%	3.5%	17.1%	4.4%
	9.00	-2.4%	1.1%	3.1%	2.0%	8.5%	2.9%	14.0%	3.8%	19.4%	4.8%
3.50	11.00	-0.8%	1.3%	5.2%	2.3%	11.2%	3.3%	17.1%	4.4%	23.1%	5.4%
	13.00	0.8%	1.6%	7.3%	2.7%	13.8%	3.8%	20.3%	4.9%	26.7%	6.0%
	9.00	1.8%	1.8%	8.6%	2.9%	15.4%	4.0%	22.2%	5.2%	29.0%	6.3%
5.00	11.00	3.3%	2.0%	10.7%	3.3%	18.0%	4.5%	25.4%	5.7%	32.7%	6.9%
	13.00	4.9%	2.3%	12.8%	3.6%	20.7%	4.9%	28.5%	6.2%	36.4%	7.5%

Table 6. Sensitivity table of percent return to investment in land, machinery, operating cost, and management for wheat-dryland corn-fallow rotation under a 1/4 landowner - 3/4 tenant cropshare lease arrangement.

Crop prices		Wheat and dryland corn yields (35 bu/ac. wheat; 45 bu/ac. corn averages)									
		Avg. - 40%		Avg. - 20%		Average		Avg. + 20%		Avg. + 40%	
		Wheat	Corn	Land-tenant	Land-owner	Land-tenant	Land-owner	Land-tenant	Land-owner	Land-tenant	Land-owner
	2.00	-12.2%	0.0%	-7.9%	0.7%	-3.5%	1.4%	0.8%	2.1%	5.1%	2.7%
2.00	3.00	-8.4%	0.6%	-2.8%	1.5%	2.8%	2.3%	8.3%	3.2%	13.9%	4.1%
	4.00	-4.6%	1.2%	2.2%	2.2%	9.1%	3.3%	15.9%	4.4%	22.7%	5.5%
	2.00	-7.8%	0.7%	-2.0%	1.6%	3.8%	2.5%	9.6%	3.4%	15.4%	4.3%
3.50	3.00	-4.0%	1.3%	3.1%	2.4%	10.1%	3.5%	17.1%	4.6%	24.2%	5.7%
	4.00	-0.2%	1.8%	8.1%	3.1%	16.4%	4.4%	24.7%	5.7%	32.9%	7.0%
	2.00	-3.4%	1.3%	3.9%	2.5%	11.2%	3.6%	18.4%	4.8%	25.6%	5.9%
5.00	3.00	0.4%	1.9%	9.0%	3.3%	17.5%	4.6%	25.9%	5.9%	34.4%	7.3%
	4.00	4.2%	2.5%	14.0%	4.0%	23.8%	5.6%	33.5%	7.1%	43.2%	8.6%

## Conclusions

The purpose of this study was to determine the return on investment and the return to management under alternative dryland cropping systems and crop share lease agreements. Additionally, if the current crop share agreement for the traditional wheat-fallow rotation is assumed equitable, then this study also sought to determine the equitable cropshare arrangement for the intensive cropping systems that are becoming more popular in the region. In addition, sensitivity analyses were conducted to determine the effects of changes in the land values, crop prices, crop yields on the returns of both landlords and tenants.

Results from the whole farm model, based on five year average prices and yields, show that the traditional wheat-fallow system at  $2/3 - 1/3$  cropshare arrangement is providing the landowner a three percent return on investment at present land values. This same level of return can be maintained under the intensive cropping systems by changing the cropshare arrangement to a  $3/4 - 1/4$  split. This arrangement will increase the return on investment for the tenant farmer to offset the additional management and risk associated with the intensive cropping system. This adjustment of the cropshare arrangement appears to offer the landowner an adequate return while allowing the tenant to be compensated for innovation and risk taking.

The sensitivity analysis shows that the price of land either at purchase or with subsequent revaluation is an important factor to the return on investment that the landowner should expect. However, the price of land does not affect the type of cropshare

lease arrangement recommended. The return on investment remains consistent across the different cropping systems, only increasing or decreasing by the same percentage as land values are increased or decreased.

Crop prices and yields will affect the return on investment for both parties in the lease, however the largest portion of the sensitivity is assigned to the tenant. Because of this significant variability, the tenant should expect to receive a higher return on investment and management. The landowner does not reach a point on any of the cropping systems where return on investment is less than zero. In contrast, the tenant has a number of situations where the return on investment is negative. The potential for negative returns or risk is offset by higher potential returns when price and yield values are higher than average.

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