

Equitable Cropshare Arrangements for Intensive Dryland Cropping Systems

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Changes in U.S. agricultural policy implemented following the 1996 Farm Act have allowed producers to consider different cropping systems without restrictions on farm program payment eligibility. As a result, planting decisions have been shifting in response to market prices, conservation compliance, and production goals. Some dryland crop producers are using more intensive dryland crop rotations to potentially increase farm income levels. For the purposes of this evaluation, intensive rotations include all systems that have more than fifty percent of the acreage in crop for each growing season. In the past three years, Western Nebraska has seen a decrease in the number of acres planted to wheat, and an increase in the number of acres planted to sunflowers, proso millet, dryland corn, and other specialty crops. Many of these crops are being grown in more intensive rotations using reduced tillage or no-till programs. The traditional wheat-fallow rotation is being evaluated in comparison to rotations of two crops in three years, three crops in four years, or continuous cropping systems.

The traditional cropping system in this area has been a winter wheat-fallow (WF) rotation that produces a winter wheat crop on approximately one-half of the crop land while the remaining land is in some type of fallow. The present system has been used to store soil moisture in the fallow year in anticipation of having added moisture available for the winter wheat grown in the next year. This system has been successful for many years, as moisture availability is a limiting factor in wheat production in the region. In recent years, advancements in herbicide technology and improvements in reduced tillage equipment and practices have inspired some producers to consider changing to more intensive rotations and reduced tillage cropping systems. With the adoption of this new technology, returns to land, machinery and management have increased by ten to forty percent depending on the rotation and tillage system used. However, the total cost of production also increases as these new systems are adopted. The potential for increased returns from the more intensive rotations is somewhat offset by increased risk to producers from increased costs of production.

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). Dryland crop acreage in the northwest region of Nebraska is nearly exclusively leased on a cropshare basis. Although cropping systems are changing, cropshare lease arrangements have been slow to follow (Nitchie, 1996). Currently the standard cropshare percentage arrangement in the area is a $2/3 - 1/3$ tenant-landowner share comprising over 75 percent of the lease arrangements in 1996 (Johnson, et al., 1998). Some change toward other arrangements is occurring. As recently as 1986, over 90 percent of the cropshare arrangements were a $2/3 - 1/3$ tenant-landowner share agreement (Johnson and Lundeen, 1987). Much of the movement away from the traditional $2/3 - 1/3$ share arrangement has been toward a $3/4 - 1/4$ 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.

With the changes in production practices and cropping systems, there may be an imbalance of costs, returns, and risk with the 2/3 - 1/3 share arrangement. The interest in intensive rotations and reduction of tillage in the region has stimulated a need for an evaluation of cropshare lease arrangements. As research in dryland cropping systems continues to show benefits in grain yield, fallow efficiency, water use efficiency, and soil erosion associated with the reduction of tillage and increasing the number of years in crop (Dhuyvetter, et al., 1996), the cropshare arrangements need to be adjusted to reflect these changes in technology. Under a traditional wheat - fallow rotation using a conventional tillage approach the 2/3 - 1/3 cropshare arrangement has been equitable, with the allocation of costs similar to the allocation of revenues. Do these traditional cropshare arrangements, which are fair for the wheat-fallow rotation, need to be adjusted to be fair to both the landowner and tenant if more intensive rotations are utilized? That is the question addressed in this paper.

Methods and Data

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. The landowner's investment in crop production includes the land and any operating costs that are shared with the tenant. The investment for the tenant includes machinery and operating costs required for growing the crops, as well as management expertise provided by the operator.

The 1999 Nebraska Crop Budgets (Selley, et al., 1999) are the basis for development of the whole farm model. Separate budgets were used for each of the crops considered for the rotation systems (proso millet, sunflowers, corn, and wheat) and for two fallow systems (traditional fallow and eco-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 (Burgener, et al., 1999). 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 yield for each crop in the rotations evaluated was adjusted, if necessary, for any rotational influences according to research on crop rotations from USDA-ARS, Central Great Plains Research Station in Akron, Colorado (Anderson, et al., 1999). The actual yields used for each of the rotations evaluated are included in Table 1.

The 1999 average dryland crop land value as published (Johnson, 1999) is \$346.00 per acre for the Northwest Nebraska. 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, evaluation of percent return to investment for both the landowner and the tenant, and the expense share were used to determine an equitable cropshare arrangement for each of the intensive cropping systems.

The cropping systems considered include: winter wheat-fallow using conventional tillage (WF CT), winter wheat-fallow using an eco-fallow or reduced tillage system (WF RT), winter wheat-proso millet-fallow (WMF), winter wheat-dryland corn-fallow (WCF), winter wheat-sunflower-fallow (WSF), winter wheat-dryland corn-proso millet-fallow (WCMF), winter wheat-dryland corn-sunflower-fallow (WCSF), winter wheat-dryland corn-proso millet (WCM), and winter wheat-proso millet (WM).

Baseline Values

The baseline lease arrangement and cropping system is the 2/3 - 1/3 arrangement used in the area for the traditional wheat-fallow rotation using a conventional tillage system. This arrangement and cropping system is established as a fair cropshare agreement by its widely accepted use throughout the region. Upon evaluation of the contributions from each party in the lease and the revenue split, the revenue and costs seem to be shared in nearly equal proportions. This traditional wheat production scenario has been in place for many years, with little change in the terms of the lease agreements. Wheat-fallow cropping systems have been the most popular and have the lowest purchased input requirement of the systems considered.

Using the baseline price (\$3.15 per bushel), yield (35 bushels per acre) and land value (\$346.00 per acre) in conjunction with the 1999 Nebraska Crop Budgets (Selley, et al, 1999), a baseline for returns and production costs were developed. The overall return to operating costs, machinery, land, and management is 5.46 percent or \$27.54 per acre (Table 2 and Table 3). In a traditional 2/3 - 1/3 cropshare lease arrangement, the tenant's return on investment and management is 9.69 percent or \$13.63 per acre, while the landowner's return is 4.00 percent or \$13.90 per acre (Table 2 and Table 3). Allocation of the total costs of production including returns to land, management, and machinery are shared at 66.16 percent charged to the tenant, and 33.84 percent charged to the landowner (Table 4). This allocation of costs is nearly equal to the 2/3 - 1/3 allocation used to divide the crop proceeds. Traditionally, this has been the preferred cropshare arrangement for the region. As this baseline analysis shows, the 2/3 - 1/3 cropshare is presently a fair arrangement for the wheat-fallow rotation.

Returns from Alternative Rotations

Each of the alternative rotations was evaluated under each of the cropshare arrangements. The results are presented in Table 2, Table 3, and Table 4. The return to land, machinery, operating, and management costs ranged from a high of \$35.69 per acre (6.29%) for the WM

rotation to a low of \$25.85 per acre (4.93%) for the WCF rotation, with the baseline WF (CT) rotation at \$27.54 per acre (5.64%). The \$10.00 per acre difference from most profitable to least profitable alternatives suggests that producers should consider risk, availability and cost of equipment, and management requirements before changing to more intensive rotations.

It is reasonable to expect that the landowner in these lease arrangements will expect that the return to land for any alternative rotation will be near the return that has been realized through the traditional WF (CT) system. This system is projected to return \$13.90 per acre (4.0%) to the landowner using a 2/3 - 1/3 cropshare lease arrangement. Using this baseline, a 3.50 to 4.50 percent range of return to landowner was used to determine which cropshare arrangements to consider as viable alternatives. Once the cropshare arrangement was evaluated on a return to landowner basis, the arrangement was then evaluated to determine if the allocation of total costs (Table 4) was equivalent to the share of revenues to be distributed under the cropshare lease.

Using the traditional 2/3 - 1/3 cropshare arrangement the intensive crop rotations increase the returns to the landowner by as much as three percent (\$10.96 per acre) while decreasing the returns to the tenant by as much as eight percent (\$9.65 per acre). The returns favor the landowner while the cost share attributed to the tenant is increased by as much 5.4 percent to 71.55 percent, although the tenant still receives only 66.67 percent of the crop.

The extreme example is the WM rotation compared to the traditional WF (CT) system. In the WF (CT) system, return to the landowner in a traditional 2/3 - 1/3 cropshare lease arrangement is 4.00 percent or \$13.90 per acre, while the tenant's return is 9.69 percent or \$13.63 per acre (Table 2 and Table 3). Allocation of the total costs of production are shared at 66.16 percent charged to the tenant, and 33.84 percent charged to the landowner (Table 4). In the WM rotation, the return to the landowner in the 2/3 - 1/3 arrangement is 7.01 percent or \$24.43 per acre, while the return to the tenant is 5.15 percent or \$11.26 per acre (Table 2 and Table 3). This creates a disincentive for the tenant to change to the more profitable system and double the number of acres planted to crop. Although the overall profitability is increased, the returns go to the landowner while the addition costs are assumed by the tenant.

Changing the terms of the lease to a 3/4 - 1/4 tenant-landowner share appears to be equitable for rotations involving two crops in three years and three crops in four years. For example, with the 3/4 - 1/4 share agreement, the WMF rotation and the WCMF rotation results in landowner returns of \$13.08 - \$14.97 per acre or 3.77 - 4.30 percent and the landowners share of total costs is between 24.23 - 26.32 percent. However, if fallow is removed from the rotation, neither the 2/3 - 1/3 nor the 3/4 - 1/4 share arrangements appear equitable. With these arrangements the landowner receives higher returns and the tenant receives lower returns, even though it is the tenant who is contributing his/her labor commitment and risk exposure.

A 4/5 - 1/5 share agreement appears equitable for the continuous WCM and WM rotations. Landowner returns on investment remain over 3.5 percent and their share of total costs are between 19.02 and 20.74 percent.

Conclusions

Although the differences in returns on a per acre basis are small, the cropshare arrangements need to be adjusted for the number of years that the land is in crop and fallow. The two year rotations of winter wheat and fallow, both in a conventional tillage and a reduced tillage system, should continue to be leased on 2/3 - 1/3 basis with the landowner purchasing a share of the fertilizer. As the rotation becomes more intensive, and the tenant takes on additional risk and management responsibilities, while the landowner continues to provide only the land and a share of the fertilizer, the fair cropshare arrangement should reduce the amount of the crop allocated to the landowner.

The fair cropshare arrangement remains a 2/3 tenant share and a 1/3 landowner share for both tillage systems in a wheat-fallow rotation. Although the returns are higher in the reduced tillage system, there is not enough change in the allocation of costs or returns to warrant changing the cropshare arrangement.

The two crops in three years (WCF, WMF, and WSF) and three crops in four years (WCMF and WCSF) systems should be changed to a 3/4 tenant share and a 1/4 landowner share to retain a fair allocation of costs and equitable returns. The results suggest that as long as the system retains at least one year of fallow within a four year period, the 3/4 - 1/4 cropshare will be equitable to both parties.

The two continuous systems (WCM and WM) should be changed to a 4/5 tenant and a 1/5 landowner share agreement to more proportionately distribute the costs and returns. This is a significant departure from the traditional cropshare arrangement, but the continuous cropping system is also a significant change from the wheat-fallow cropping system. The 4/5 - 1/5 arrangement presents greater than 3.5 percent return to the landowner in both systems while allocating the costs on a 80 percent and 20 percent share (within plus or minus one percent).

Cropshare arrangements are based on tradition in most areas, thus suggesting changes in these arrangements is usually met with some resistance. The present economic climate, changes in the U.S. farm policy, increases in viable crops, and advancements in technology are having an impact on the cropping systems being used throughout the region. As these cropping systems change, it appears that the lease agreements in the region need to be revised, to remain equitable to both tenants and landowners.

Table 1. Projected yields for selected crops under each rotational system.

Rotation	Selected Crops			
	Wheat bu/acre	Corn bu/acre	Proso Millet cwt/acre	Sunflower cwt/acre
WF (CT)	35.00	-----	-----	-----
WF (RT)	38.00	-----	-----	-----
WCF	38.00	42.75	-----	-----
WMF	38.00	-----	18.00	-----
WSF	32.00	-----	-----	10.00
WCMF	38.00	45.00	18.00	-----
WCSF	38.00	38.25	-----	10.00
WCM	24.70	40.50	19.00	-----
WM	22.80	-----	20.00	-----

Shaded blocks represent area average yields.

Table 2. Returns to operating, machinery, management (tenant), land (landlord), and total costs under selected crop rotation systems.

Rotation	Return to investment and management (\$/acre)						
	Total Return \$/Acre	2/3 -1/3 share		3/4 - 1/4 share		4/5 - 1/5 share	
		Tenant	Landlord	Tenant	Landlord	Tenant	Landlord
WF (CT)	27.54	13.63	13.90	-----	-----	-----	-----
WF (RT)	28.49	13.01	15.48	18.39	10.10	21.63	6.86
WCF	25.85	6.35	19.50	12.74	13.11	16.58	9.28
WMF	31.63	12.18	19.45	18.56	13.08	22.38	9.25
WSF	28.52	9.47	19.05	15.74	12.77	19.51	9.01
WCMF	29.58	7.60	21.98	14.61	14.97	18.81	10.77
WCSF	28.09	6.36	21.73	13.31	14.79	17.48	10.62
WCM	28.84	3.98	24.86	11.71	17.13	16.35	12.50
WM	35.69	11.26	24.43	18.88	16.81	23.46	12.24

Shaded blocks represent recommended cropshare arrangements.

Table 3. Percent return to operating, machinery, management (tenant), land (landlord), and total costs under selected crop rotation systems

Rotation	Return to investment and management (%)						
	Total Return	2/3 - 1/3 share		3/4 - 1/4 share		4/5 - 1/5 share	
		Tenant	Landlord	Tenant	Landlord	Tenant	Landlord
WF (CT)	5.64%	9.69%	4.00%	-----	-----	-----	-----
WF (RT)	5.92%	9.76%	4.45%	13.76%	2.91%	16.15%	1.98%
WCF	4.93%	3.63%	5.57%	7.24%	3.76%	9.39%	2.66%
WMF	6.25%	7.67%	5.60%	11.65%	3.77%	14.04%	2.67%
WSF	5.32%	5.03%	5.48%	8.34%	3.68%	10.32%	2.60%
WCMF	5.54%	4.12%	6.29%	7.88%	4.30%	10.13%	3.09%
WCSF	5.06%	3.09%	6.22%	6.43%	4.24%	8.43%	3.05%
WCM	4.95%	1.72%	7.10%	5.03%	4.91%	7.00%	3.58%
WM	6.29%	5.15%	7.01%	8.61%	4.83%	10.68%	3.52%

Shaded blocks represent recommended cropshare arrangements.

Table 4. Allocation of total costs to tenant and landlord under specified cropshare arrangements.

Rotation	Allocation of Costs (%)					
	2/3 - 1/3 share		3/4 - 1/4 share		4/5 - 1/5 share	
	Tenant	Landlord	Tenant	Landlord	Tenant	Landlord
WF (CT)	66.16%	33.84%	-----	-----	-----	-----
WF (RT)	66.34%	33.66%	72.59%	27.41%	76.88%	23.12%
WCF	70.23%	29.77%	76.09%	23.91%	80.02%	19.98%
WMF	67.70%	32.30%	73.77%	26.23%	77.92%	22.08%
WSF	69.51%	30.49%	75.36%	24.64%	79.32%	20.68%
WCMF	69.91%	30.09%	75.77%	24.23%	79.72%	20.28%
WCSF	70.72%	29.28%	76.47%	23.53%	80.33%	19.67%
WCM	71.55%	28.45%	77.20%	22.80%	80.98%	19.02%
WM	69.40%	30.60%	75.28%	24.72%	79.26%	20.74%

Shaded blocks represent recommended cropshare arrangements.

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