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Strategies for Managing Risk
Under Long-Term Farmland Leases

by
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STRATEGIES FOR MANAGING RISK UNDER LONG-TERM FARMLAND LEASES

Glenn D. Pederson*

Traditional share leasing arrangements became less common during the past decade in response to changing general farm economic conditions (Baron 1982; Atkinson 1983). Several influential factors can be cited: 1) changes in the expected level and stability of commodity prices, 2) changes in tax laws, and 3) risk perceptions and preferences of landlords and tenants. Although it is not clear the extent to which risk-sharing considerations have motivated this trend, the desire to manage risk using nontraditional leasing alternatives has been one of the factors.

Flexible cash rental arrangements represent a viable risk-sharing alternative for negotiating a long-term lease. The primary objective of this paper is to illustrate the relative effectiveness of alternative long-term cash rental strategies for tenants and landlords when crop prices and yields are risky. Fixed and flexible cash rent alternatives are compared as selected crop price and yield distributions are systematically changed to reflect different levels of yield risk at the farm level during 1979-82. Preferred rental strategies for landlords and tenants are identified and conclusions are drawn concerning why tenants and landlords would have fared better under those long-term arrangements.

Flexible Cash Arrangements

Flexible arrangements establish a mutually agreed on procedure for adjusting the lease payment when actual prices and yields vary from their expected levels. Advantages of flexible cash rents are a reduction in risk to the tenant when actual prices and/or yields fall below normal, and additional income to the landlord and tenant when prices and/or yields rise

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above the normal or expected level. Corresponding disadvantages are that the tenant will be required to share part of his windfall income when prices and/or yields rise above the normal level, and the landlord's risk is increased when prices and/or yields fall below anticipated levels. A common disadvantage to both tenant and landlord is that the flexible cash rent may be more difficult to calculate (Henderson 1979).

There are numerous ways to flex cash rents, yet the most commonly used methods involve flexing for price variability or for both price and yield variability. Flexible cash rental arrangements seldom adjust rents for unexpected changes in the cost of inputs.

The concept of a base cash rent is common to most flexing arrangements. Base rent represents an expected cash rent which is acceptable to the landlord and tenant. Base rent can be determined using any, or a combination, of the following: 1) market cash rent, 2) a landlord's desired rate of return on the land investment, 3) a net share rent equivalent to the landlord, or 4) an acceptable net return to the tenant. This study uses average market cash rent to establish the base cash rent level.

Commodity price flexibility can be achieved by establishing a unit price ratio, realized (post-harvest) price to expected (pre-harvest) price, which is multiplied times the base rent to determine the annual cash rent.

Price and yield flexibility employs both the unit price ratio and a yield ratio, realized (post-harvest) yield per acre to expected (normal) yield per acre. Both ratios are multiplied times the base rent. Under this procedure the effects of price and yield variations are potentially offset if prices and yields systematically move in opposite directions.

Method of Analysis

Alternative distributions of annual returns to operator's labor, machinery and farm overhead were computed for single-crop farm plans during

1979-82. The annual return to indirect inputs was defined as the gross return per acre less the sum of 1) direct (total cash) costs per acre by crop enterprise, and 2) the associated annual cash rent per acre. Direct costs for each crop enterprise were assumed to be independent of variations in yields. Direct costs for wheat, barley, sunflower, and corn were taken from published crop budgets (USDA 1981).

Historical yield data reflect the average annual county yields from 1969 through 1981. Yield levels represent dryland, continuous-cropping systems in the farming region. Commodity prices were initially determined from reported monthly prices received by farmers from 1979 through 1982.¹ Estimates of the average prices and yields, and their associated variability were derived from the historical data series to identify representative initial price and yield distributions.

A computer program was developed to select random prices and yields from the above distributions.² Cropping choices and renting arrangements were analyzed as yield risk was altered. Yield variability was simulated with a mean-preserving spread adjustment (increasing the standard deviation and range of yield holding the expected yield constant) to reflect farm-level risk for the crops being considered.³

Two methods were used to identify the preferred rental arrangement for each decision maker. Stochastic dominance with respect to a function was used to compare the annual net returns distribution under each rental alternative. Stochastic dominance is being increasingly used in farm management applications to identify the most efficient choice under risk (King and Oamek 1983, Kramer and Pope 1982). Cumulative probability distributions (CPDs) for renting alternatives were compared for risk-averse decision makers to rank those alternatives. Under this criteria the entire

shape of the distribution of returns is considered when selecting a long-term rental arrangement.

The second method of selection employs a "safety-first" rule by which the renter or landlord accepts the alternative with the highest probability of generating a return above some minimal (or desired) level. For the landlord that minimal level could be the base rent or some other acceptable cash rent. In the tenant's situation it is defined as the minimum acceptable net return to the indirect factors of production (overhead, unpaid labor, management, and depreciation) after direct costs and land rent have been paid.

Evaluation Strategy

Two risk environments were analyzed--a "low yield risk" environment (which used historical county-average distributions of yields) and a "typical farm yield risk" environment. Typical farm yields were assumed to be 30 percent more variable than historical county-average yields. Price distributions were not adjusted in the analysis.

Price and yield bounds may be an effective means of controlling exposure to price and/or yield variability and the corresponding unexpected variations in rent paid, or received. These bounds were arbitrarily set at 10 percent above and below the expected price and yield in the following analysis to represent bounded flexibility options. Landlords and tenants were assumed to share equally in windfall gains and losses outside the pre-designated ranges. The base rent (average cash market rent) for the period analyzed was \$38.50 per acre.

Five cash rental alternatives were compared: 1) fixed, 2) price flexible, 3) price and yield flexible, 4) bounded price flexible, and 5) bounded price and yield flexible.

Results

Simulated tenant and landlord returns per acre for 1979-82 demonstrated that 1) the selection of a long-term rental arrangement was not identical across all crops and 2) the rental arrangement best suited for a given crop was not highly sensitive to increased yield variability. The analysis also confirmed the view that selection of a long-term rental arrangement will depend most significantly on the decision maker's risk management objective.

Pair-wise comparisons using stochastic dominance selection indicated that risk-averse tenants would have generally fared better under fixed cash rent than under one of the flexible cash arrangements (Table 1). The exception was spring wheat, for which a 10 percent bounded flexible price and yield arrangement worked best. For individual crops the selected rental arrangement was unchanged by increasing the level of yield variability. A similar comparison of rental income distributions by crop enterprise indicated that risk-averse landlords would have improved their income situation by using one of the flexible rent options.

Use of a "safety-first" objective, which focuses on total "downside risk", to select a rental arrangement resulted in an identical ranking of rental options across risk environments (Table 1). The probability of a tenant generating a return to the indirect inputs greater than zero ranged from 50 percent (on barley) to 100 percent (on sunflower). These probabilities generally decreased slightly as overall yield variability was increased to reflect the typical farm yield environment. The conclusion drawn was that the tenant concerned primarily with downside risk (i.e., negative returns) would likely have selected the same rental arrangement as a tenant who evaluated the entire distribution of returns. The landlord's situation was similar. Landlords concerned with the likelihood that rental

TABLE 1. PREFERRED CASH RENTAL ARRANGEMENTS OF TENANTS AND LANDLORDS FOR FOUR PRINCIPAL CROPS IN SOUTHEAST CENTRAL NORTH DAKOTA FOR TWO YIELD RISK ENVIRONMENTS

Decision Maker	Crop			
	Wheat	Barley	Sunflower	Corn
	<u>Low Yield-Risk Environment</u>			
Tenant	bounded flexible price and yield (65%) ^a	fixed (50%)	fixed (100%)	fixed (77%)
Landlord	flexible price (57%) ^b	flexible price and yield (50%)	flexible price and yield (60%)	flexible price and yield (67%)
	<u>Typical Farm Yield-Risk Environment</u>			
Tenant	bounded flexible price and yield (60%)	fixed (52%)	fixed (97%)	fixed (75%)
Landlord	flexible price (57%)	flexible price and yield (55%)	flexible price and yield (62%)	flexible price and yield (57%)

^aThe percentage shown in parentheses for the tenant are the probabilities that the tenant would receive a positive return after direct cash costs and cash rent were deducted from gross returns.

^bThe percentages shown in parentheses are the probabilities that the landlord would receive a rental payment at least as large as the average market cash rent.

income per acre should equal or exceed the average cash market rent would have selected the same arrangement under both risk situations. The probability associated with meeting that minimum return requirement was unchanged for wheat, slightly raised for sunflower and barley, and significantly reduced for corn, as overall yield variability was increased.

On the surface these results would generally appear to contradict the general view that risk-averse tenants would benefit most from risk-sharing under a flexible arrangement. This inconsistency for barley, corn, and sunflower appears to be a result of the different ways in which fixed and flexible arrangements can be evaluated and the underlying shape of each crop's price and yield distribution.

Risk-sharing under a flexible arrangement generally did reduce the size of losses which the tenant would have realized under fixed cash rent. This is illustrated for wheat in Figure 1 by a comparison of the CPDs of returns per acre under fixed and flexible cash rents. Negative cash returns were larger (a \$34.20 loss per acre) and accumulated probability faster with flexing than under the fixed cash rent alternative. Thus, the tenant would have reduced the size of his losses by using the flexible price and yield option on wheat. However, the tenant was also obligated to share returns with the landlord at the top end of the distribution. The flexible price and yield option cumulated probability more rapidly (due to sharing) than the fixed cash rent alternative when returns were above average.

The CPDs for the landlord show the mirror-image of the tenant's situation. To participate in higher rental income per acre the landlord would need to accept greater risk that cash rent per acre would be less than the fixed rent level. Figure 2 illustrates the comparison of fixed and flexible rental options for spring wheat. The fixed cash rental CPD is

Probability

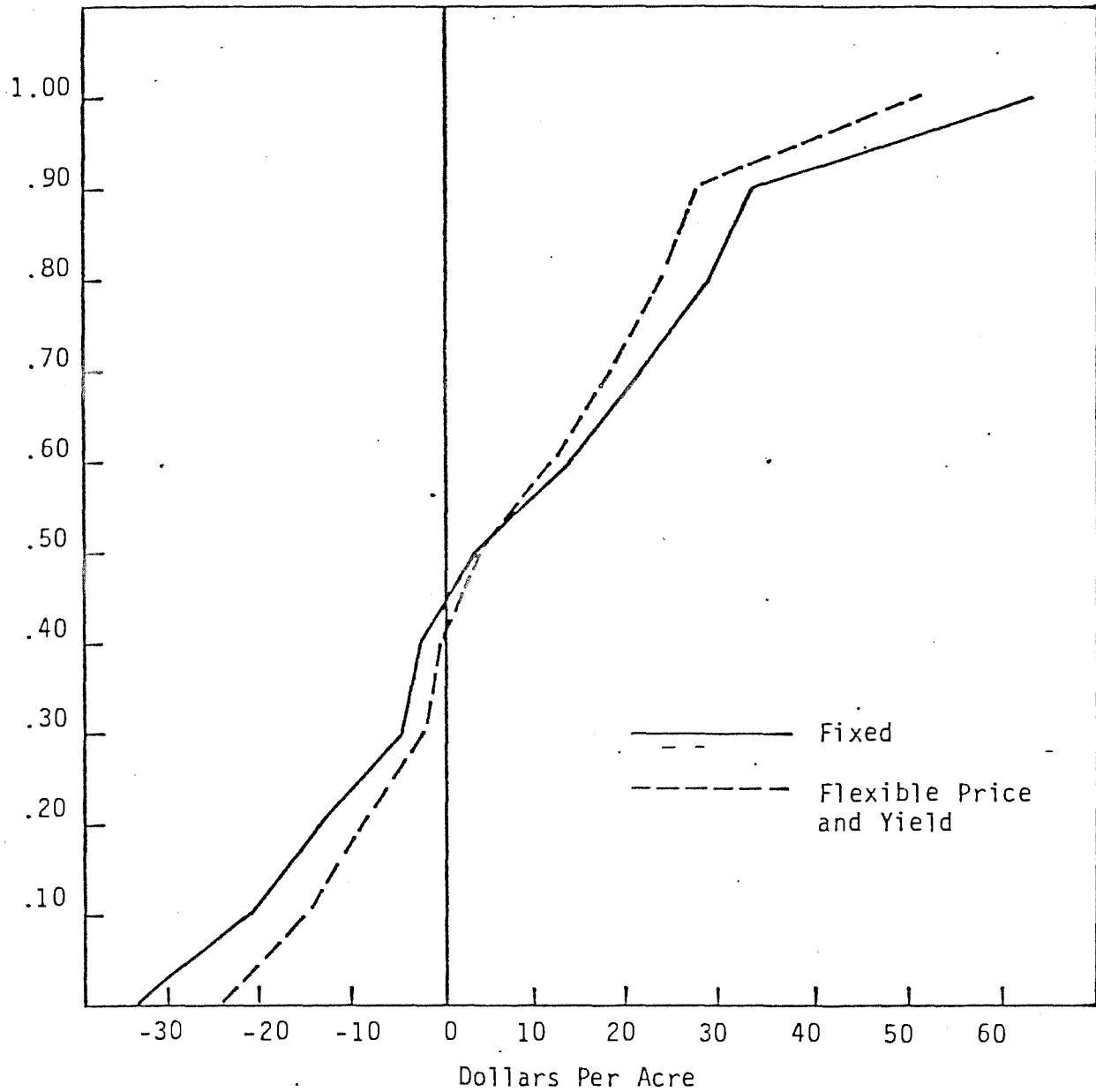


Figure 1. Cumulative Probability of Tenant Returns from Wheat Under Fixed and Flexible Cash Rental Arrangements

Probability

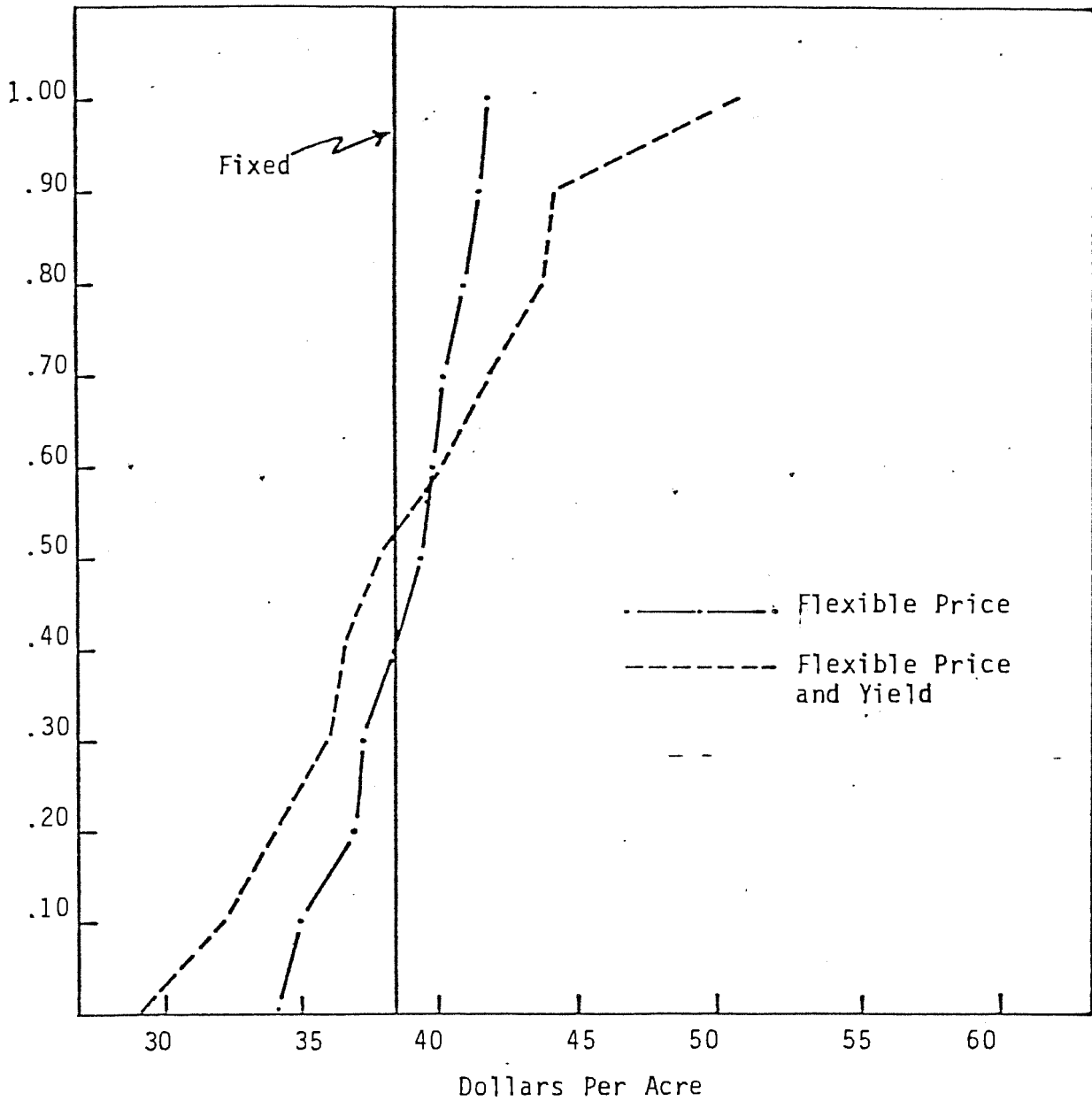


Figure 2. Cumulative Probability of Landlord Rental Income from Wheat Under Fixed and Flexible Cash Rental Arrangements

Footnotes

¹In a long-term rental agreement it is assumed that renters and landowners consider up to three or four years as a relevant period from which to formulate price expectations. Additionally, the assumed price series is comparable with 1981 enterprise cost estimates. This price series represents average market price levels.

²Prices and yields were assumed to be multi-variate, beta-distributed random variables with means, standard deviations, and bounds as defined by estimates from secondary data at the county level. Simulated distributions were intercorrelated where historical data indicated a significant relationship existed.

³The analysis did not consider several factors which are expected to influence tenant and landlord rental preferences. Size of the farming operation and the percentage of owned versus leased acres were not considered. The financial positions of the tenant and landlord were not included in the analysis. Finally, the influence of government commodity programs on the price distributions was not considered, although the effects of those programs on price risk could be included.

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