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CROPLAND LEASE ARRANGEMENTS AND SOIL EROSION IN THE U.S.

by

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ABSTRACT

Information from the USDA's 1978 Resource Economics Survey is used to test the hypothesis that crop-share leasing, when compared to cash leasing, promotes improved conservation management in crop production. Results are discussed in light of public policies to promote soil erosion control on U.S. cropland.

CROPLAND LEASE ARRANGEMENTS AND SOIL EROSION IN THE U.S.

Land tenure has historically been included among the factors thought to impede soil conservation efforts on U.S. cropland. One can argue on conceptual grounds that an owner-operator's effort to conserve soil should be superior to a tenant's because of incentives to incorporate erosion-induced changes in annual net income and terminal asset value into decisions on land use (McConnell). A renter may tolerate relatively more soil loss because increases in land value due to conserving soil, or capital loss due to soil depletion, accrue to the landlord.

The theoretical case for less soil erosion on owned/operated land does not rule out the possibility of conservation treatment on leased land. First, some crop management practices which help conserve soil--such as reduced tillage and residue management--appear to be cost-effective in their own right, require no overt action by a landlord, and thus may be neutral to tenure (Lee; Bills). Second, tenant and landlord can fashion leasing arrangements which explicitly take soil conservation considerations into account. However, such institutional factors as tenure insecurity, lack of agreement on sharing conservation treatment costs, and inadequate information are thought to hamper this process (Bunce; USDA, 1938).

Relatively little evidence is available on the influence leasing arrangements have on the conservation treatment accorded rented farmland. The purpose of this paper is to contrast soil erosion rates, soil erodibility, and level of conservation management on cropland

leased under cash and crop-share rental agreements. These contrasts, drawn from the USDA's 1978 Resource Economic Survey, have a direct bearing on the erosion/land rental issue because a crop-share agreement signals more substantive landlord involvement in the farming operation. One would hypothesize that crop-share rented cropland receives superior conservation treatment for two reasons: (1) joint decisions on cropping practices may increase the possibility for explicit consideration of soil conservation objectives, (2) landlords who farm on shares receive differential treatment under the Internal Revenue Service Code on any conservation expenditures they make on their land. Landlords who "materially participate" in a farming operation can take the income and expenses they incur into account in calculating taxable income. They can expense, rather than capitalize, conservation-related improvements to their land (U.S. Dept. of the Treasury). Expensing reduces the pretax income required to make a conservation improvement economically feasible (Boxley and Anderson; Collins).

Data and Procedures

The study is based on land use and landownership data from the U.S. Department of Agriculture's Resource Economics Survey. The Survey includes the Soil Conservation Service's (SCS) 1977 National Resource Inventory (NRI), which provides data on land use and land quality, and the 1978 Landownership Survey (LOS).

The 1978 LOS was linked to the 1977 NRI (Lewis). The NRI was based on a point sample of the U.S. land area, stratified on the basis

of land units that were generally 160 acres in size. The LOS was accomplished by contacting the owner of the first sample point in each land unit with a mail survey. The Survey was confined to privately owned land, and usable data was collected from about 37,000 private landowners (65 percent of all sample points known to be privately owned).

Several steps were taken to incorporate the Survey data into this study:

(1) The NRI and LOS records were merged and the file was truncated to roughly 9,900 records to include only those sample points which were (a) used for cropland according to the 1977 NRI and (b) either operated by the owner or farmed by a tenant.

(2) Parameters for the Universal Soil Loss Equation (Wischmeier and Smith) were used to estimate sheet and rill erosion at each sample point.

(3) Following procedures devised by Bills and Heimlich, information from the Universal Soil Loss Equation was used to assign each sample point to one of three erosion classes: nonerodible, moderately erodible, or highly erodible. Each class discriminates cropland based on the physical parameters governing annual soil loss from rainfall (RKLS) and a 5-ton-per-acre-per-year (TAY) soil loss tolerance. Nonerodible cropland will erode at or below 5 TAY under any management due to sheet and rill erosion; moderately erodible cropland will erode above or below 5 TAY depending on management

applied; highly erodible cropland will not erode at or below 5 TAY except under the most restricted rotation and conservation support practices.

(4) The management components (CP) governing annual rate of sheet and rill erosion were used as a quantitative measure of land management at each sample point. The C and P factors reflect the joint effect of crop enterprise, tillage practices, and conservation support practices (such as stripcropping or contour farming) on soil loss rate.

Results

The NRI data show that gross sheet and rill erosion approached 2 billion tons in 1977. For NRI cropland data used in this study, rainfall erosion averages 4.95 tons per acre per year (TAY)--Table 1. Soil loss was 4.7 TAY on owned-operated cropland and 5.3 TAY on rented land.

Crop-share leasing is the predominant rental arrangement reported for this rented land; over one-third of all landlords rent out their land on a cash lease (Table 2). This description of leasing arrangements runs counter to estimates derived from data for Census-defined farmland. Wunderlich used Census data to estimate that 66 percent of all rented land in farms is rented for cash. A number of factors probably explain these differences. First, Census data are for farmland, not the subaggregate cropland. Second, the Census aggregate land in farms includes much publicly owned land, particularly Federal land used for grazing purposes in the West. The bulk of this public

Table 1--Average annual soil loss for owner-operated and rented cropland sample points, United States, 1977

Land tenure	Sample points	Average soil loss
	Number	Tons/acre/year
Owner	6,149	4.70
Renter	3,784	5.33
Total[1]	9,933	4.95

[1] Excludes Alaska.

Source: 1978 Resource Economics Survey.

Table 2--Average annual soil loss by type of lease, United States, 1977

Type of lease	Sample points		Average soil loss
	Number	Percent	Tons/acre/year
Cash rent	1,297	34.3	5.13
Share rent	2,132	56.3	5.59
Cash rent/share rent	291	7.7	4.90
No response	64	1.7	3.42
Total[1]	3,784	100.0	5.33

[1] Excludes Alaska.

Source: 1978 Resource Economics Survey.

land is probably rented for cash. Public land was excluded from the Resource Economic Survey. In the context of cropland, crop-share rental appears to be more important than expected when referring to more conventional Census data.

Average erosion rates are remarkably similar for cash-rented and share-rented cropland (Table 2). Share rental, which signals more landlord involvement in farm management decisions, does not lead to reduced soil loss on average. The hypothesis that rainfall erosion rates on share- and cash-rented cropland are not significantly different at the national level is supported with these USDA data.

However, concentrating on annual soil loss rate alone can lead to confusion over the role of management factors in erosion control (Bills and Heimlich). Soil loss is conditioned by management but is predicated on physical factors. With respect to rainfall erosion, these physical factors have to do with the inherent erodibility of the soil, rainfall patterns, and topography. This distinction means that similarities in annual soil loss rate, as noted above for share-leased and cash-leased cropland, may in fact reflect noteworthy differences in conservation management if one category of land tends to have significantly more physical erosion potential than the other.

To clarify these relationships and to more authoritatively test the hypothesis that crop-share leasing may lead to more attentive conservation management, the USLE was partitioned into its component parts. Then, cash- and share-leased land was grouped into soil erodibility classes. Each class discriminates physical erosion potential in reference to a 5 TAY soil loss tolerance. Finally, average CP

values, the management components of the USLE, were computed for each soil erodibility category and for each leasing arrangement.

The results, shown in Table 3, do not support the hypothesis that soil erodibility (determined by RKLS, the physical parameters governing the annual rainfall erosion rate) is materially different for cash-leased and share-leased cropland.

From the standpoint of conservation management, average CP factors tend to be greater for share-leased land than for cash-leased land (Table 3). Since annual soil rate increases as CP increases, this implies slightly more intensive management, on average, for share-leased cropland. Higher CP values are generally observed, regardless of cropland's erodibility. In all cases, however, variability around each mean CP--as reflected in coefficients of variation--is quite large. This variability, as one might expect, reflects wide differences in the management practices used by tenants. Such variability also prevents one from accepting the hypothesis that management is significantly different on cash- and share-leased cropland.

Policy Discussion

Today, about 40 percent of U.S. farmland is leased; nearly 90 percent of this leased land is owned by individuals and corporations who, by Census definition, do not farm (U.S. Dept. of Commerce). Some observers contend that cash leasing promotes less attention to the management considerations which affect soil conservation objectives for the Nation's cropland.

Table 3--Soil erodibility and management status (CP factor) for cash-rent and share-rent cropland, United States, 1977

Soil erodibility[1]	Cash rent		Share rent	
	Sample points	Average CP	Sample points	Average CP
Nonerodible	440	.260 (62)[2]	781	.310 (48)
Moderately erodible	733	.248 (60)	1,169	.270 (52)
Highly erodible	124	.261 (50)	182	.260 (50)
Total[3]	1,297	.251 (60)	2,132	.284 (49)

[1] Nonerodible cropland will not erode from sheet and rill erosion at a rate greater than 5 TAY regardless of management applied; moderately erosive cropland will erode above or below 5 TAY depending on management applied; highly erosive cropland will not erode at or below the 5 TAY rate except under the most restricted rotations and conservation support practices (Bills and Heimlich).

[2] Numbers in parentheses are coefficients of variation expressing standard deviation from the mean as a percentage of the sample mean.

[3] Excludes Alaska.

Source: 1978 Resource Economics Survey.

The results of this study have some bearing on that issue. Although crop-share rental is thought to signal more landlord involvement in a farming operation involving leased land, aggregated national data do not support the hypothesis that crop-share leasing promotes material differences in the management parameters which govern soil loss from rainfall erosion. The USDA's Resource Economic Survey shows that well over half of all rented U.S. cropland is under share lease. However, average annual soil loss rates were remarkably similar on cash- and crop-share leased cropland for the 1977 crop year. The similarities persist even after taking the physical erosion potential of rented cropland into account.

These results do not contradict those obtained for rented cropland in a single Missouri watershed; Ervin also hypothesized that a crop-share lease would provide stronger incentives to landlords for erosion control but found that this arrangement was not a significant explanatory variable in an analysis of soil loss rates on rented cropland. However, results obtained here, as well as those obtained by Ervin, do not conform with a recent study based on national data on conservation investments, which indicates that landlords who use a share lease are more likely to invest in soil conservation (Baron, 1981). However, Baron's study was narrowly focused upon investments in conservation-related land improvements and did not incorporate information on annual soil loss rates.

On the other hand, the findings of this study are also provisional due to deficiencies in the data. First, the data are highly aggregated and may mask important differences at the subnational

level. A logical extension of this study would be to examine a richer data set. Second, the Survey data are confined to sheet and rill erosion. Results from the 1982 NRI indicate that erosion from wind causes significant soil erosion in some instances (USDA, 1984). Unfortunately, companion data on landownership are not available for the more recent inventory. The association between wind erosion and cropland leasing arrangements is unknown.

With these limitations in mind, however, the available evidence does not indicate that crop-share leasing is necessarily good for soil conservation. Conversely, concerns about the prominence of cash leasing in U.S. agriculture do not appear to be well placed. Cash-leased cropland appears to receive as much conservation treatment as cropland farmed on shares. The results also provide little support for the notion that the Internal Revenue Service Code, currently structured around conservation deductions for farmers and for landlords who farm on a crop-share basis with their tenant, disadvantages erosion control on cash-rented cropland. Although share-lease landlords can treat conservation-related investments in land as an ordinary business expense, the evidence presented here does not support the hypothesis that conservation expensing has a material effect on conservation effort for leased cropland.

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