

The Economics of Sharecropping in NE Brazil

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I. Introduction

Recently the economic interrelationships between landowners and sharecroppers have been studied by many researchers. Much of the recent literature has advanced the theory of share tenancy (Cheung, Ho, Newbery, Reid, Stiglitz, Warr), although some work has aimed at empirically testing parts of the theory (Kutcher and Scandizzo, Rao). Much of this renewed interest represents the concerns of policymakers responsible for agricultural and rural development in Third World countries.

Using farm level data from Northeast Brazil, where sharecropping is dominant among large farms, this paper reports on attempts to estimate the effects of differing contractual arrangements between landowners and sharecroppers on the landowner's net income. The landowner faces important choices concerning various components of the sharecropping contract. He must evaluate the economics of altering the sharecropper's share vs. changing the amount of land provided a sharecropper; using obligatory sharecropper (sujeicao) labor vs. employing more hired workers; and changing the margin earned from marketing the sharecropper's marketable surplus.

II. Problem Setting

A. Characteristics of Large Sharecropped Farms

The mean characteristics of twenty-eight large sharecropped transitional farms randomly surveyed in the semi-arid area of Ceara in Northeast Brazil are presented in Table 1.^{1/} These observations include farms drawn from municipios

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(counties) where cotton production predominates. The average farm size is 434.9 hectares. The farms include relatively moist (type A) land, drier (type B) land and natural pasture land. Crops are grown on types A and B land. This cropland is cultivated partly by the landowner and partly by the sharecropper. Cattle are grazed on natural pasture.

Perennial cotton is the most important crop enterprise of the farm in terms of area cultivated and cash income. Relatively more of the cotton grown by the owner is in the five-year cotton rotation rather than the three-year rotation. The reverse relationship is apparent for sharecroppers. Cattle are an important complementary enterprise as they graze the cotton stubble left standing after harvest. The average number of cow units per farm is 26.4.^{2/}

The production technology is transitional; that is, much of the soil cultivation is done by hand but some insecticides are used. Work animals are used for transport but generally not for cultivating. Cattle are land-extensive and use few purchased inputs and little labor, except for growing planted pasture.

B. The Sharecropping Contract

In the study region, landowners and sharecroppers negotiate a sharecropping contract which includes several components. In this setting the landowners wield most economic, social and political power but they cannot unilaterally dictate the terms of a sharecropping contract since sharecroppers have economic alternatives. The contract generally is verbal but nonetheless real for both the landowner and sharecropper. It is apparent that both parties actively press their demands during the contract bargaining process.

A contract typically includes the following components: 1) the specific share the owner is to receive, if any, of each crop, 2) the size of each sharecropper's plot, 3) the amount of sujeicao labor the sharecropper provides to the landowner for use on owner operated production, and 4) the marketing charge

the landowner receives for selling the sharecropper's share of the cash crop and surplus food crops. Sharecropper family food requirements are also a concern in this region where most subsistence requirements are met from own production. This study assumes that the subsistence food requirement is specified and non-negotiable. Accordingly, bargaining between landowners and sharecroppers occurs only over the four cited components of the contract.^{3/}

1. The Share

The landowner receives a share of most sharecropper production. The share usually differs between cash and subsistence crops. Cotton output is generally equally divided, while the landowner typically receives 30 percent of food crops.

2. The Size of the Sharecropped Plot

The sharecropper on the average receives a 7.8 hectare plot. The size of the plot varies directly with the share of each crop paid to the landowner.^{4/}

3. Sujeicao Labor

Sharecroppers are commonly required to provide labor to the landowner for a daily wage somewhat less than that earned by temporary or permanent laborers. The number of man-days provided depends on the size of the plot, that is, the larger the plot the more man-days of labor per hectare cropped the sharecropper must make available to the landowner.

4. The Marketing Charge

Sharecroppers generally sell their share of cash crops and surplus food crops through the landowner. The landowner usually retains a marketing margin.

III. Model Structure

A linear programming model was used to test the sensitivity of the landowner's use of sharecropping to parameterized values for the components of the contract. The enterprise mix of both the owner and the sharecropper and the landowner's net income are determined for all solutions. The model assumes the

owner maximizes income without considering the effects of risk.

1. The Objective Function

The landowner is assumed to maximize net income defined as:

- Money receipts from sale of products
- + marketing charge for selling sharecropper's marketable surplus
- costs of purchased inputs
- interest charged on short term credit required for crop and livestock activities
- reservation wages for family farm members.

This measure ignores on-farm consumption by the landowner, and thus overstates actual income to a limited extent. A reservation price on land was omitted since it is assumed to have no alternative uses in the short run. Likewise no alternative use (savings activity) was introduced for farm cash balances.

2. Activities

Production activities are defined for both the landowner and sharecropper. The landowner may produce crops and cattle but sharecroppers are restricted to crops as most contracts prevent them from holding cattle. The crop activities include the interplanting of cotton with corn and beans in both three-year and five-year rotations, the interplanting of corn and beans, and the isolated cropping of beans, rice, manioc and planted pasture. Two types of land are specified with respective yield and operating cost differences.

Activities are specified for selling crops; hiring temporary, permanent, and sujeicao labor, and number of sharecroppers employed. Minimum land and consumption requirements are specified for the sharecropper. In return, the sharecropper provides a specified amount of labor to the owner measured in man-days per hectare cropped per each of four production periods in the year. Cash operating expenses are specified for all production activities and for hiring non-family labor.

3. Restrictions

Except for accounting rows and balances, restrictions pertain to available

supplies of land, family and permanent labor, initial cash balances and borrowing limits. Temporary labor use is unconstrained by available supply. Type A cropland is used by the landowner for growing rice, interplanted corn and beans, manioc and planted pasture and by the sharecropper for rice. Type B cropland is used for interplanting cotton, corn and beans in either a three or five year rotation by both the landowner and sharecropper. The sharecropper also uses Type B land for corn and beans. Cattle graze on natural pasture and cotton stubble.

IV. Results of the Analysis

A. Base Solution

The base solution to the model described above is shown in Table 1. The assumptions underlying the base model are: (1) cotton share on a 50-50 basis; all other crops shared on a 30-70 basis; (2) no minimum land equivalent size of the sharecropped plot; (3) the supply of sujeicao labor per period in Period I (soil preparation) 2.7, Period II (planting) 1.8, Period III (cultivating) 2.2 and Period IV (harvesting) 3.0; and (4) a marketing charge of 15 percent.

The base solution is a good approximation of the mean values for farms surveyed. Both the number of sharecroppers employed per farm and the size of the sharecropped plot closely approximate the sample. The model underestimated the area in three-year higher yielding but more labor intensive cotton and other crops was overestimated. These differences may be due in part to the fact that risk considerations were not considered.

B. Results of Parameterizing Components of the Contract

1. Minimum Land Requirement

Table 2 contains the results of parameterizing the sharecropper's minimum land equivalent requirement holding all other components of the contract constant. The results reported include landowner's net income, the number of sharecroppers employed and the crop enterprises of both.

The land requirement was parameterized in two hectare increments from the base value of zero to 14 hectares. No change in optimum solution occurred over the 0-8 hectare range. At a 10 hectare level, however, the landowner's income decreased 2.4 percent and the number of sharecroppers per farm decreased 7.1 percent. The most significant change occurred in the sharecropper's enterprise mix. The sharecropper cultivates 15.8 hectares of five-year cotton, while three-year cotton declines by 42 percent. The area in other crops increases slightly.

When the requirement was raised to 12 hectares, the owner's income declines 8.9 percent, one less sharecropper was employed, and sharecroppers cultivate only five-year cotton and other crops. The owner in turn reduces three-year cotton 72 percent.

At 14 hectares, the owner eliminates sharecroppers entirely and he reduced his cropping to 5.7 hectares. Furthermore, the owner also discontinues cattle and his income drops 72.5 percent below the base solution.

2. The Cotton Share^{5/}

The effect on owner income of parameterizing the share of cotton received while holding the share of other crops constant is direct and non-linear. As the share increases, owner's income increases at a decreasing rate, while decreasing the share decreases income at an increasing rate. When the share is zero, income is 19.5 percent below the base solution; when receiving 100 percent of the cotton, income rises by 22.5 percent.

Throughout the range zero to 80 percent of cotton paid to owner, the number of sharecroppers employed is constant. When he receives all the cotton, the owner would increase the number by a mere 7.1 percent.

No changes in enterprising mix occur except at the limits of zero and 100 percent share. At zero, the owner's enterprise mix remained unchanged, but the

sharecropper's cultivated 24 percent less three-year cotton, and manioc entered the solution for the first time at 1.8 hectares. With a 100 percent share, the owner discontinued producing cotton, and increased the sharecropped higher productivity three-year cotton by 24.3 percent.

3. Sujeicao Labor

The supply of sujeicao labor was parameterized from zero to 100 percent of the base solution. As expected the owner's income and the supply of sujeicao labor are positively related, but the relationship is non-linear. The income of the owner increases at a decreasing rate with equal incremental increases in sujeicao labor.

Landowner's might be expected to employ fewer sharecroppers as the supply of sujeicao labor decreases; however, the converse occurs. With zero labor, the owner employs 7.5 sharecroppers compared with 7 in the base solution. Doubling the per period supply results in 6.6 sharecroppers employed.

When the supply of sujeicao labor falls below fifty percent of the base solution, the owner discontinues cotton and total cultivated area drops 36.6 percent. The sharecropper increases cotton area by more than 24 percent however. In contrast, doubling sujeicao labor supply per period increases owner cultivated cotton 92.4 percent and decreases sharecropper cultivated cotton 22.5 percent.

4. Marketing Charge

Parameterizing the marketing charge from 1 to 25 percent obviously affected the landowner's income. It did not affect the number of sharecroppers employed and the crop enterprise mix of either the owner or sharecropper.

V. Implications

Some policymakers have argued that as a way of reducing rural poverty, sharecropper contracts should be written and regulated to increase sharecropper's benefits. Ignoring the difficulty of enforcing such changes, this paper shows

that landowners may be quite sensitive to changes in important components of the contract. When alternative, but higher priced, forms of farm labor are available, institutional changes intended to benefit sharecroppers may lead to less sharecropping and the use of more temporary laborers who frequently are economically even worse off. Furthermore, landowners may choose less labor intensive enterprises which have a correspondingly lower value of production. In the Brazilian case, changing the share of cotton paid to landowners appears to be a particularly sensitive component of the contract. Thus, just as Green Revolution technologies have been reported to alter sensitive landowner - sharecropper relations resulting in the expulsion of some sharecroppers, so might efforts to change and enforce sharecropper contracts. The gains received by sharecroppers retained by landowners must be weighed against the losses of others that might be expelled.

Table 1. Characteristics of Large Sharecropped Farms in the Semi-Arid Area of Ceara

Item	(1) Sample Survey	(2) Base Solution
Net Income of Landowner (000 Cr \$)	36.4	33.8
Farm Size (ha)	434.9	434.9
Cropland (ha)	65.0	65.0
Owner-Operated (ha)	20.8	15.0
Sharecropped (ha)	44.2	50.0
Natural Pasture	216.4	216.4
Number of Sharecroppers	6.6	7.0
Size of Sharecropped Plot (ha)	7.8	7.1
Crop Enterprise Mix		
Owner-Operated Part of Farm		
Cotton, 3 year rotation (ha)	3.1	7.9
Cotton, 5 year rotation (ha)	5.8	0.0
Other Activities (ha)	11.9	7.1
Sharecropped Part of Farm		
Cotton, 3 year rotation (ha)	17.2	37.4
Cotton, 5 year rotation (ha)	11.2	0.0
Other Activities (ha)	15.8	12.6
Number of Cow Units	26.4	26.4

Source: (1) IBRD-SUDENE Farm Survey

(2) Base Solution of Model

Table 2

Model Results Parameterizing Minimum Size of Sharecropper Plot^{a/}

Minimum Land Equivalent Requirement	Owner's Net Income	Sharecropped Part					Owner-Operated Part				
		Number of Sharecroppers (Number)	Area Cultivated	Enterprises			Area Cultivated	Enterprises			
				Cotton		Other Crops (ha)		Cotton		Other Crops	
				5 Yr	3 Yr			5 Yr	3 Yr		
(ha)	(000 Cr \$)										
Base (0)	33.8	7.0	50.0	0.0	37.4	12.6	15.0	0.0	7.9	7.1	
4	33.8	7.0	50.0	0.0	37.4	12.6	15.0	0.0	7.9	7.1	
8	33.8	7.0	50.0	0.0	37.4	12.6	15.0	0.0	7.9	7.1	
10	33.0	6.5	50.2	15.8	21.7	12.7	14.9	0.0	7.5	7.4	
12	30.8	6.0	55.3	42.9	0.0	12.4	9.7	0.0	2.1	7.6	
14	9.3	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0	5.7	

^{a/} The assumptions of the base model are:

1. Minimum land equivalent requirement per sharecropper family (ha): 0.0.
2. Owner's shares: Cotton-50%, Other crops-30%.
3. Sujeicao labor requirement (man-day equivalents): Period 1, 2.7; Period 2, 1.8; Period 3, 2.2; Period 4, 3.0.
4. Marketing change (%): 15.
5. Sharecropper's subsistence requirement (kg): Rice, 400; Corn, 311; Beans, 363.

Footnotes

1. The data used in this paper were gathered in 1973 under the World Bank-SUDENE Northeast Agriculture Survey Project. The senior author was a field consultant of the Bank on this project. The normal disclaimers apply.
2. A cow unit is defined as including 1 cow, .04 bulls, .39 two year old steers, .41 one year old steers and .43 calves.
3. The sharecropper-owner relationship involves other concerns of somewhat lesser importance such as (1) location of the sharecropper plot on the farm, (2) cost-sharing arrangements, (3) credit terms for the sharecropper who generally borrows from the landowner.
4. The greater the share the more willing the landowner is to increase the size of the sharecropper's plot. Similarly, the sharecropper demands a larger plot as the share paid to the landowner increases. The sharecropper is vitally concerned with the size of his plot relative to crop shares paid the landowner. At stake, for the sharecropper in this relationship, is his family's physical survival, especially during drought years which occur regularly in Ceara.
5. Tables presenting the results of parameterizing the cotton share, sujeicao labor and the marketing charge are not included in this paper; however, these tables, which are similar in form to Table 2, are available on request.

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