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Economics of Share-Cropping in Haryana (India) Agriculture

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This study shows that most share-croppers are small farmers. There is some evidence that technical efficiency is lower on share-cropping farms. There is significant allocative inefficiency on both share-cropping and owner-operated farms, but neither group has definite advantage in allocating every input. Above all, there does not seem to be any inherent inefficiencies in the "voluntary share-cropping system". Share-croppers make intensive use of labour, and in the absence of gainful off-farm employment opportunities, share-cropping provides them necessary supplementary income.

I. INTRODUCTION

There is a sizeable theoretical literature[1] on share-cropping tenancy in agriculture, and the bulk of it treats share-cropping tenancy as some static institution. But this is not quite true, at least in the case of India. Share-cropping has been a significant part of the land tenure system in India. As it once existed, Bhaduri [6] categorized it "semifeudalism". However, during 1950s, the government of India enacted a number of legislations to protect the interests of share-croppers. The share-croppers, who had been cultivating a certain piece of land since a certain date specified in the legislation, had the option to buy that land, and the government even subsidized such purchases.

In order to avoid the withdrawal of land from production, the legislation governing share-cropping arrangements allows that when due to unavoidable circumstances the landlord is unable to cultivate his entire land himself, he can rent it out or give it to share-cropper(s) for one crop year. The legislation specifies that under such arrangements the landlord is entitled to one-third of the gross output. But if he shares the expenditure of the purchased inputs, then his share can vary accordingly.

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[1] Early literature on share-cropping was summarized by Johnson [8]. Since then, significant contribution to the theory has been made by Bardhan [1], Bardhan and Srinivasan [3], Bell and Zusman [5], Cheung [7], Newbery [9], Stiglitz [10], and others.

This helped in eliminating most of the explicit or implicit exploitation of share-croppers [2]. But "voluntary share-cropping" is still widespread. While the time-series evidence indicates that agricultural development has led to a decrease in the incidence of tenancy, inter-regional cross-sectional data seem to suggest that agriculturally more advanced regions have a larger proportion of area under tenancy [1, p. 48].

There is very little literature which treats share-cropping as a dynamic institution. In order to trace the transition of share-cropping from "semi-feudalistic" to a voluntary institution one would need time-series of micro level data. However, the "voluntary share-cropping" can prevail primarily due to two reasons. First, there are some small farmers who are unable to produce income sufficient for family needs, from their own land, and in the absence of gainful off-farm employment opportunities, they must find additional land to operate. This creates strong demand for land. There is generally some land available for cash rent, but it is usually quite limited. Therefore, there are some small farmers who have to engage in share-cropping even if the informal arrangements are unfavourable to them, since in the absence of gainful off-farm employment opportunities, they must make a living out of farming, and farming alone. Second, due to legislative measures and improved agricultural technology, share-cropping may have become economically efficient tenure system, at least in India. In this paper, we throw some light on the questions posed by these two propositions.

The plan of the paper is as follows. In the second section, we provide a brief description of the data used in this study. Next, we present data to throw some light on the proposition that primarily small and poor farmers engage in share-cropping. In section four, we compare the economic efficiencies of the share-cropped and the owner-operated farms, while summary and some concluding remarks are made in the last section.

II. DESCRIPTION OF DATA

We have access to farm-level data from Haryana in India, for the 1969-70 agricultural year. Haryana is one of the agriculturally better-off states of India. The data were collected from 119 individual farms. Out of these, 20 farms were fully irrigated, 17 totally unirrigated, and remaining 82 farms partly irrigated and partly unirrigated. A unique feature of these data is that information about output and all inputs had been collected separately for irrigated and unirrigated parts of the same 82 farms. Therefore, we divided 82 partly irrigated farms into two sub-sets of farms; the irrigated area of each farm was treated as an irrigated sub-farm and the unirrigated area of each farm as unirrigated farm. Therefore, there are 102 (= 82 + 20) irrigated farms, and 99 (= 82 + 17) unirrigated farms, and total number of observations becomes 201. Among the 17 totally unirrigated farms, 7 are share-croppers. Furthermore, there are 27 and 31 share-cropping farms in the samples of 102 irrigated and 99 unirrigated farms, respectively. In this study, we compare the owner-operated and share-cropped farms in all of the above samples.

III. CHARACTERISTICS OF OWNER-OPERATED AND SHARE-CROPPED FARMS

The neoclassical marginal analysis does not provide a proper framework for testing the hypothesis that poor farmers engage in share-cropping to achieve a minimum subsistence income. A more appropriate approach to shed light on this hypothesis is to present data on the amount of land leased in and out by farm size, the distribution of gross income from owned area on share-cropped and owner-operated farms, gross income, expenditure and net income per hectare on the two groups of farms, the distribution of stipulated shares, the landlord participation rates in the purchase of inputs, and comparison of subsistence and cash-crop mix on the two groups of farms. Simple analysis of such data is presented in Tables 1 – 6.

The information presented in Table 1 shows that almost 50% of the share-cropping farms own less than or equal to 4.05 hectares, while only less 20% of the owner-operated farms fall in the size group. More than 91% of the share-cropping, and only about 60% of the owner-operated farms own less than or equal to 8.09 hectares of land. Therefore, it is true that a larger percentage of the share-cropping farms are small as compared to the owner-operated farms. But relatively large farms also engage in share-cropping. However, it is not true that every small farm is a share-cropping farm. There can be a number of reasons for this.

(1) Land owned by the owner-operated farms may be relatively more fertile, and may use larger amounts of inputs per hectare, and hence they may be able to produce relatively larger output as compared to the share-cropped farms.

(2) The family size on the owner-operated farms may be smaller than on the share-cropping farms of similar size, and hence a relatively smaller income would be sufficient to support their families.

(3) The demand for share-cropped land is greater than its supply. Therefore, the oligopsonist landlords can ration their land, and in order to oblige their large number of clients and to avoid any legal difficulties they may rotate the share-croppers every year.

(4) Owner-operated small farms may have off-farm sources of income.

There is no information about the family size, land quality of the two groups of farms, the demand and supply of share-cropping farms, and off-farm income. But

Table 1

*Amount of Land Owned and Leased in According to the Size Classification of Owned Area**

Distribution of Owned Area in Hectares	Number of Farms		Amount of Land Leased in				Owned Area (Hectares)			
			Cash-Rented		Share-Cropped					
	Share Cropping	Owner-Operated	Irrig.	Unirrig.	Irrig.	Unirrig.	Irrig.	Unirrig.	Total	Average
≤2.02	7 (20.59)	1 (1.18)	12.55**	2.83	12.68	5.93	5.50	5.14	10.64	1.52
>2.02 ≤3.05	6 (17.65)	4 (4.71)		.96	4.63	5.53	9.37	6.81	16.18	2.70
>3.05 ≤4.05	4 (11.76)	11 (12.94)		.61	2.77	11.38	7.18	7.90	15.08	3.77
>4.05 ≤5.06	3 (8.82)	10 (11.76)	.20			2.03	6.18	6.97	13.15	4.38
>5.06 ≤6.07	5 (14.71)	12 (14.12)	1.01		3.44	5.39	14.77	12.96	27.73	5.55
>6.07 ≤7.08	4 (11.76)	8 (9.41)		5.79	2.06	13.68	10.04	16.87	26.91	6.73
>7.08 ≤8.09	2 (5.88)	5 (5.88)	.20	4.26	.25	3.14	1.01	13.75	14.76	7.38
>8.09 ≤10.12	1 (2.94)	10 (11.76)			.20		4.22	4.07	8.29	8.29
>10.12	2	24			4.13	4.55	12.45	8.15	20.60	10.30
Total for 34 Share-Cropping Farms	34 (99.99)	85 (100.00)	13.96			51.63	70.72	82.62	153.34	
Average for 34 Share-Cropping Farms			.41	.43	.89	1.52	2.08	2.43	4.51	
Average for 85 Owner-Operated Farms							4.16	4.16	8.32	

*None of the 119 farms in the sample leased out any amount of land at all.

**A single farm cash-rented in 12.15 hectares of irrigated land. Average size of the operational holding (i.e. owned area plus cash-rented and share-cropped area) of the 119 farms is 8.42 hectares.

it would not be incorrect to say that land is scarce in India, and the small farm operators are generally looking for additional land to increase their income. We have information about the distribution of gross farm income from owned area on the share-cropping and owner-operated farms, and it is given in Table 2. Almost 9 percent of the share-cropping farms have gross income less than 2,500 rupees from their owned land, and more than 20 percent of them have gross income less than 5,000 rupees as compared to only 7 percent of the owner-operated farms. About 80 percent of the share-cropping farms have income below 10,000 rupees, and less than 45 percent of the owner-operated farms fall in this range of gross income, while the average gross income of all 119 farms in the sample is Rs. 11, 805. Therefore, a relatively larger percentage of the share-cropping farms obtain lower income as compared to the owner-operated farms. In the absence of information on the relative family sizes of the two groups of farms, one can not conclude that the income from the owned area of the share-cropping farms is insufficient for family needs. However, there is little reason to believe that share-croppers have relatively smaller families, and the family size is likely to be similar for the two groups of farms. Thus, it will be necessary for the share-cropping farms to generate additional income to achieve a living standard comparable to that of the owner-operated farms. But information presented in Tables 1 and 2 does not rule out the possibility that some farmers, especially those who own relatively larger areas, regard share-cropping as a pure business undertaking.

Comparative analysis of gross income, expenditure, and net income for the two groups of farms is presented in Table 3. This shows that the share-cropping farms have lower net income in all cases. The most striking result is that significant number of share-cropping farms experience negative net income from both irrigated and unirrigated areas, and above all exactly 50 percent of them have negative net income from the land they actually share-cropped. Therefore, it can be concluded that most of the farmers engage in share-cropping to generate additional income to meet their family needs and are less concerned with the profit maximization. But we still can not rule out that there may be others who regard share-cropping as a business undertaking.

A comparison of subsistence and cash-crop mix on the two groups of farms may further shed some light on this question. Such comparative analysis is given in Table 4. At least, a part of every crop grown by Haryana farms is used for the consumption of the household. Therefore, there is not a very sharp distinction between the subsistence and cash crops in India. But still some small distinction can be made between the two categories of crops. The share-cropping farms have, on an average, a higher percentage of area under bajra, gram, other pulses, sugar cane, (which was converted into *gur* and *shakkar*), *desi* cotton, and fodder. The last two crops and the pulses are definitely used on the farm itself. Bajra, and gram are the staple foods of most of Haryana, especially southern and southwestern Haryana which is sandy

and relatively dry. *Gur* and *shakkar* are also usually for family consumption. Therefore, there is some qualified evidence that the share-cropping farms put relatively larger area under subsistence crops.

It is believed that subsistence crops require relatively lower quantities of new purchased inputs like fertilizer, capital, irrigation, and improved seeds, but they are labour-intensive. Our analysis of the data presented in Table 5 shows that the share-croppers use higher amounts of human and bullock labour, but consistently use lower amounts of fertilizer, irrigation, capital and "other expenses". This may be due to the lack of cash. The data in Table 6 show that the participation rates of the landlords in the purchase of inputs are rather small. More than 91 percent of the landlords contribute less than 25% to the cost of purchased inputs. Therefore, it is likely that the difference in the input levels used by the two groups of farms may disappear if the participation rates of the landlords will increase in the future. There

Table 2

Distribution of Gross Income from Owned Area on Share-Cropped and Owner-Operated Farms

Income (Rs.) from Owned Area	Share-Cropped	Owner-Operated
≤ 2,500	3 (8.82)	
2,500 and 5,000	4 (11.76)	6 (7.06)
5,000 and 7,500	14 (41.18)	18 (21.18)
7,500 and 10,000	6 (17.65)	14 (16.47)
10,000 and 15,000	5 (14.71)	30 (35.29)
15,000 and 20,000	2 (5.88)	9 (10.59)
20,000 and 25,000		1 (1.18)
25,000 and 30,000		3 (3.52)
30,000		4 (4.71)
Total	34 (100.00)	85 (100.00)

Note: Average income from all 119 farms is Rs. 11, 805.

is already some evidence from a recent survey in India that with the introduction of high-yielding varieties, and availability of irrigation, the landlords are sharing more of the cost [2].

In brief, we can conclude from the above discussion that the share-cropping farmers own relatively small acreage, and most of them seem to engage in share-cropping primarily to supplement their income, to meet the reasonable needs of their families, although it can not be ruled out that at least some of them may practise share-cropping for profit maximization. Actually, there is some evidence from Indian literature that some of the share-croppers are quite enterprising and they already own relatively large farms [2, p. 292]. In order to shed further light on this issue, we will have to compare the economic efficiency of the owner-operated and share-cropped farms, and this will be the subject of the next section.

IV. COMPARATIVE ECONOMIC EFFICIENCY

The economic efficiency has two components: the technical efficiency and allocative efficiency. The absolute as well as relative allocative efficiency can be analyzed in the production function framework. The technical efficiency, however, is quite sensitive to the specification of the production function. If one just assumes, without testing that underlying production function is linear homogeneous, one may be led to believe that the differences in allocative efficiency and in the configuration of input and output prices are responsible for any differences in yields and factor

Table 3

Gross Income, Expenditure, and Net Income per Hectare

Farms	Gross Income	Expenditure	Net Income
27 Irrigated Share-Cropping Farms	1,859.31	1,829.01	30.30*
75 Irrigated Owner-Operated Farms	2,081.83	1,745.83	336.00
31 Unirrigated Share-Cropping Farms	990.35	868.81	121.54**
68 Unirrigated Owner-Operated Farms	759.52	558.57	200.95
Only Share-Cropped Area on 34 Farms	980.65	520.06	460.59
Landlord's Share on 34 Farms	425.61	66.71	358.90
Tenant's Share on 34 Farms	555.04	453.35	101.69***

*13 farms out of 27 share-cropping farms had negative "net income", per hectare, from their total irrigated area operated, which includes owned, cash-rented, and share-cropped area.

**Only 5 out of 31 share-cropping farms had negative "net income" per hectare from their total unirrigated area operated, which includes owned, cash-rented, and share-cropped area.

***Exactly 17 (i.e. 50%) out of 34 share-cropping farms had negative "net income" per hectare from the area they actually share-cropped.

Table 4

Area Sown under Different Crops on Share-Cropping and Owner-Operated Farms

Crops	34 Share-Cropping Farms	85 Owner-Operated Farms	27 Irrig. Share-Cropping Farms	75 Unirrig. Owner-Op. Farms	31 Unirrig. Share-Cropping Farms	68 Unirrig. Owner-Op. Farms
Rice	11.70 (3.36)	62.20 (6.29)	10.89 (7.23)	58.28 (10.83)	.81 (.41)	3.92 (.87)
Jowar	7.75 (2.22)	28.49 (2.88)	3.09 (2.05)	15.59 (2.90)	4.66 (2.36)	12.90 (2.86)
Bajra	72.25 (20.75)*	178.21 (18.01)	11.06 (7.34)	33.15 (6.16)	61.19 (30.97)	145.06 (32.14)
Maize	6.29 (1.81)	28.26 (2.85)	2.40 (1.59)	17.77 (3.30)	3.89 (1.97)	10.49 (2.32)
Wheat	53.79 (15.45)	203.05 (20.52)	42.54 (28.24)	178.06 (33.08)	11.25 (5.69)	24.99 (5.54)
Barley	4.43 (1.27)	23.87 (2.41)	3.29 (2.18)	17.67 (3.28)	1.14 (.58)	6.20 (1.37)

Continued –

Table 4 – *Continued*

Crops	34 Share-Cropping Farms	85 Owner - Operated Farms	27 Irrig. Share-Cropping Farms	75 Unirrig. Owner - Op. Farms	31 Unirrig. Share-Cropping Farms	68 Unirrig. Owner-Op. Farms
Gram	92.08 (26.44)*	179.80 (18.17)	18.52 (12.30)	56.61 (10.52)	73.56 (37.23)	123.19 (27.29)
Other Pulses	8.20 (2.35)*	17.81 (1.80)	.41 (.27)	5.77 (1.07)	7.79 (3.94)	12.04 (2.67)
Rape & Mustard	6.75 (1.94)	30.41 (3.07)	.65 (.43)	15.62 (2.90)	6.10 (3.09)	14.79 (3.28)
Other Oilseeds	.52 (.15)	3.55 (.36)	.52 (.35)	1.66 (.31)		1.89 (.42)
Sugar cane *Gur*	10.19 (2.93)*	25.00 (2.53)	9.79 (6.50)	22.00 (4.09)	.40 (.20)	3.00 (.66)
Sugar cane (Seed)	1.56 (.45)	12.59 (1.27)	1.56 (1.04)	10.37 (1.93)		2.22 (.49)
Cotton *Desi*	12.79 (3.67)*	18.50 (1.87)	12.79 (8.49)	17.09 (3.17)		1.41 (.31)

Continued –

Table 4 – *Continued*

Cotton American	6.13 (1.76)	26.74 (2.70)	6.13 (4.07)	26.74 (4.97)		
Fodder	30.40 (8.73)*	66.62 (6.73)	13.95 (9.26)	36.28 (6.74)	16.45 (8.32)	30.34 (6.72)
Other	23.39 (6.72)	84.46 (8.53)	13.03 (8.65)	25.54 (4.75)	10.36 (5.24)	58.92 (13.05)
	348.22 (100.00)	989.56 (100.00)	150.62 (99.99)	538.20 (100.00)	197.60 (100.00)	451.36 (99.99)

Note: Figures in the parentheses are percentages.

Table 5

Per Hectare Values of Output and Variable Inputs on Owner-Operated and Share-Cropped Farms

	Samples*											
	1		2		3		4		5		6	
	a	b	a	b	a	b	a	b	a	b	c	d
Output (Rs.)	14.59	12.49	14.59	12.48	20.82	18.59	7.60	9.90	10.67	7.73	18.59	9.90
Labour Days	62.54	71.43	60.86	68.48	82.34	94.52	39.50	49.36	52.36	66.81	94.52	49.36
Fertilizer (Rs.)	56.50	40.00	56.50	39.62	100.68	74.10	12.64	14.00	28.59	10.89	74.10	14.00
Irrigation (Rs.)	53.59	31.84	53.66	31.84	107.63	74.98	0	0	0	0	74.98	0
Capital (Rs.)	93.34	52.78	93.48	52.80	149.11	86.18	37.69	29.04	36.54	24.45	86.18	29.04
Other Expenses (Rs.)	80.07	78.06	80.14	78.04	112.35	120.80	47.76	47.32	76.59	37.96	120.80	47.32
Bullock Labour (Days)	17.67	21.17	16.67	18.68	20.55	26.56	12.77	13.21	18.90	15.08	26.56	13.21

Continued –

Table 5 – *Continued*

*Samples 1, 2, 3, 4, 5, and 6 represent the sample of 119 aggregate, 201 irrigated and unirrigated, 102 irrigated, 99 unirrigated, 17 totally unirrigated, and 58 irrigated and unirrigated share-cropping farms, respectively.

[a]Corresponds to owner-operated farms.

[b]Corresponds to share-cropping farms.

[c]Refers to irrigated share-cropping farms.

[d]Refers to unirrigated share-cropping farms.

intensities, while actually the answer may lie in the technological differences among the distinct groups of farms [4]. In this study, therefore, we first examine the assumptions of linearity and homogeneity of the production function describing the nature of farms in our sample. The assumption of linearity is satisfied if the elasticity of scale is unity. Hence, we estimate the scale elasticity, and test the homogeneity assumption, and only then we proceed to compare the technical and allocative efficiencies of the owner-operated and share-cropped farms.

Returns to Scale

To estimate the returns to scale (i.e. scale elasticity) of various farm samples, the following Cobb-Douglas production function was fitted in the log-linear form:[2]

$$\ln V = \ln A + h_o \ln L + \alpha_2 \ln (N/L) + \alpha_3 \ln (F/L) + \alpha_4 \ln (I/L)$$

$$+ \alpha_5 \ln (K/L) + \alpha_6 \ln (O/L) + u \qquad \ldots \qquad (1)$$

where $\ln A$ is a constant,

V = the value of crops and crop by-products in rupees, per farm. (The main by-products are wheat straw, maize and sorghum stocks, and cotton sticks, etc.).

L = land area operated in hectares per farm. It includes owned area, cash rented-in, and share-cropped area.

N = number of human labour days used per annum on individual farms. It includes family labour, and permanent and casual hired labour.

F = value (in rupees) of fertilizer and manure used on individual farms.

I = rupee value of the flow of irrigation services on individual farms. It includes depreciation value interest cost, and operating and repair expenses of tubewells, pumping sets, and Persian wheels, plus the payments made for canal irrigation water.

K = the rupee value of the flow of capital services from agricultural machinery, equipment, implements, and tools. This value includes depreciation charges, interest cost, and repair and operating expenses.

[2]This presupposes that the farms in the samples are characterized by a Cobb-Douglas type production function. Cobb-Douglas production function is linear and homogeneous, and, therefore, it rules out the possibility of non-homotheticity. A non-homothetic function of the form:
$\ln V = \ln A + \alpha_1 \ln L + \alpha_2 \ln N + \alpha_3 \ln F + \alpha_4 \ln I + \alpha_5 \ln K + \alpha_6 \ln O + \alpha_7 (\ln L)^2 + u$ was fitted. But the coefficient α_7 was not significantly different from zero. Furthermore, the samples of 143 owner-operated, 102 irrigated, 75 owner-operated irrigated and 27 irrigated share-cropping farms are characterized by constant returns to scale. Therefore, we can not reject the assumption that the observed samples of farms, especially the ones with constant returns to scale, are characterized by the Cobb-Douglas production function.

O = the rupee value of other production expenses for individual farms. It includes actually paid and imputed value of land rent, seeds, and miscellaneous expenses.

u = a random disturbance term which is assumed to be normally distributed with mean zero, and finite variance.

Equation (1) is estimated using various farm samples, and the Ordinary Least Squares estimates of this analysis are given in Table 7. These results show that the samples of 119 aggregate, 85 owner-operated, 34 share-cropped, 58 share-cropped in the pooled sample of 201, 201 pooled, and 99 unirrigated farms are characterized by decreasing returns to scale, while all other samples are characterized by constant returns to scale. Therefore, all of the farm samples do not exhibit constant returns to scale, and some of the samples actually exhibit decreasing returns to scale.

Table 6

Distribution of Stipulated Shares and Landlord Participation Rates in the Purchase of Inputs

Distribution of Percentages of Gross Income/Expenditure	Number of Farms	
	Gross Income	Expenditure
⩽ 2 percent		8 (23.53)
> 2 ⩽ 5%		6 (17.65)
> 5 ⩽ 10%		5 (14.71)
> 10 ⩽ 25%		12 (35.29)
> 25 ⩽ 33%		
> 33 ⩽ 50%	11 (32.35)	3 (8.82)
⩾ 50%	23 (67.65)	
Total	34 (100.00)	34 (100.00)

Note: Figures in the parentheses are percentages.

Table 7

Ordinary Least-Squares Estimates of Returns to Scale for Different Samples

	Samples										
	1	2	3	4	5	6	7	8	9	10	11
ln A	5.6605	5.0968	5.9022	5.6023	5.0739	6.1574	5.6160	5.3523	4.8571	6.6692	5.9084
	(16.7780)	(12.3423)	(10.1520)	(22.8690)	(15.4134)	(14.8873)	(19.5498)	(14.1644)	(7.8707)	(14.4184)	(4.6644)
Ln L	.3029	.2220	.3698	.4830	.3989	.5723	.6035	.5630	.4137	.3984	.3544
	(4.0687)	(3.6304)	(4.3814)	(9.1703)	(6.0149)	(5.8525)	(10.6045)	(8.0702)	(3.0829)	(3.8642)	(2.4969)
ln N	.0508	.0418	.0328	– .0379	– .0178	– .0583	.0724	.024	.0703	– .0932	.1704
	(.9066)	(0.6082)	(0.3732)	– (.8710)	– (.3253)	– (.8255)	(1.6557)	(1.8974)	(.7909)	–(1.0504)	(1.3053)
ln F	.1039	.0702	.1107	.0435	.0333	.0433	.0318	.0110	.0543	.0627	.1353
	(5.3691)	(2.8447)	(3.7813)	(2.0369)	(1.2076)	(1.3448)	(1.5945)	(.4201)	(1.9433)	(1.7533)	(2.0586)
ln I	.0493	.0470	.0509	.0762	.0587	.1111	.1014	.0952	.1360		
	(3.0652)	(2.5490)	(1.8830)	(3.6317)	(2.2437)	(3.2885)	(3.5718)	(2.6404)	(2.6909)		
Ln K	.1642	.1102	.0524	.226	.2045	.1596	.1420	.0989	.1682	.2686	.1105
	(4.3538)	(2.5280)	(0.6016)	(5.3183)	(3.8194)	(2.2574)	(4.1688)	(2.2372)	(2.7657)	(3.4675)	(.4483)
ln O	.1277	.3698	.2139	.1420	.2763	.0746	.0790	.1750	.1501	.1883	.0083
	(3.5426)	(5.2234)	(2.6560)	(3.2407)	(3.8510)	(1.0814)	(1.8671)	(2.4283)	(2.5295)	(2.6800)	(.0890)

Continued –

Table 7 – *Continued*

	1	2	3	4	5	6	7	8	9	10	11
h_o	.7988	.8343	.7453	.9294	.9539	.9026	1.0301	1.0455	.9926	.8248	.7789
	(16.7957)	(15.0867)	(8.2189)	(27.1423)	(22.2151)	(16.0271)	(36.9989)	(28.8745)	(24.2150)	(12.8370)	(3.9589)
h_1	– .2012	– .1657	– .2547	– .0706	– .0461	– .0974	.0301	.0455	– .0074	– .1752	– .2211
	– (4.2304)	– (2.9969)	– (2.8091)	– (2.0625)	– (1.0733)	– (1.7298)	(1.0796)	(1.2558)	– (.1815)	–(2.7266)	–(1.1236)
R^2	.8065	.8402	.8780	.8320	.8310	.8961	.9391	.9306	.9722	.6928	.8382
n	119	85	34	201	143	58	102	75	27	99	17

h_o is the elasticity of (returns to) scale.

h_1 gives the deviation of the scale elasticity from unity. It can also be calculated directly by estimating a modified equation (1), where ln V is replaced by ln (V/A).

Here the output elasticity of land = $h_o - \sum_{1=2}^{6} \alpha_i$, and the corresponding t-value of α_1 (i.e. output elasticity of land) from the formula·

t-value of $\alpha_1 = \alpha_1 / \left\{ \mathrm{Var}(h_o - \sum_{1=2}^{6} \alpha_i) \right\}^{1/2}$.

Technical Efficiency

The main objective in this section is to analyze the relative technical efficiencies of the onwer-operated and share-cropped farms, and to find out whether the two groups of farms are represented by (a) neutral technologies or (b) factor-biased technologies. In order to test these differences in the technologies the following log-linear Cobb-Douglas production function has been fitted :

$$\ln V = \ln A + D + \alpha_1 \ln L + \alpha_2 \ln N + \alpha_3 \ln F + \alpha_4 \ln I + \alpha_5 \ln K + \alpha_6 \ln O + B_1 (\ln L) D + B_2 (\ln N) D + B_3 (\ln F) D + B_5 (\ln K) D + B_6 (\ln O) D + u \quad \ldots (2)$$

where D is a dummy variable, which assumes the value zero for the owner-operated farms, and unity for the share-cropping farms. All other variables are the same as defined before.

In the first step, Equation (2) was estimated using Ordinary Least Squares method, in its original form. But in the final analysis only statistically significant dummy variables were included along with all the real variables. The final results are presented in Table 8. These results show that the owner-operated and the share-cropped farms are represented by neutral production functions in case of pooled sample of 201 farms, of 102 irrigated, and 99 unirrigated farms. The coefficient of the (intercept) dummy variables for the share-cropping farms is negative and statistically significant in all samples, except the 34 share-cropping farms in the sample of 119 farms, where it is positive but non-significant. But, these two groups of farms are represented by the factor-biased (non-neutral) production functions in case of 119 aggregate, and 17 totally unirrigated farm samples. Therefore, in the strict sense, it is not possible to compare technical or allocative efficiencies of the two groups of farms, in case of these two samples, since here the two groups of farms are represented by different production functions. However, in the samples of 201 pooled, 102 irrigated, and 99 unirrigated farms, the share-cropped farms are technically less efficient as compared to owner-operated farms. The results in column 6 show that the irrigated share-cropped farms have higher technical efficiency than the unirrigated share-cropping farms.

Allocative Efficiency

A rigorous comparison of the allocative efficiencies of any two groups of farms requires that they are (a) characterized by constant returns to scale, (b) represented by the same or neutral technologies, and (c) facing the same configuration of input

Table 8

Estimates of Production Functions for Owner-Operated and Share-Cropped Farms[a]

	Samples					
	1	2	3	4	5	6
Ln A	4.9770	5.5877	5.3853	5.3647	6.6681	5.3504
	(13.3517)	(22.2596)	(18.1913)	(13.2602)	(6.2523)	(8.9836)
D	.6059	– .1514	– .6640	– .0359	– 1.5979	.7269
	(1.4128)	– (1.9813)	– (2.3808)	– (1.7375)	– (3.8745)	(1.8555)
Ln L	.2506	.5217	.5632	.3988	.2820	.5436
	(4.7965)	(9.0124)	(9.7553)	(3.8247)	(2.4280)	(4.4209)
ln N	.1092	– .0337	.0870	– .0947	.1873	– .0544
	(1.9810)	– (.7898)	(2.0297)	– (1.3699)	(1.9275)	– (.7912)
ln F	.0484	.0325	.0196	.0419	.0098	.0422
	(2.5243)	(1.9265)	(1.0448)	(1.6117)	(.2321)	(1.5580)
ln I	.0322	.0641	.1044			.2064
	(2.8704)	(4.0144)	(3.5458)			(3. 0442)
ln K	.1143	.1951	.1230	.2485	–. 2359	.1479
	(2.9192)	(4.6262)	(3.5681)	(3.1580)	– (.9880)	(2.1479)
ln O	.3146	.1880	.1435	.2683	.3233	.1291
	(5.8567)	(3.7693)	(2.8606)	(3.1245)	(3.0094)	(1.8131)
(ln F) D	.0575				.2524	
	(1. 7412)				(2. 9911)	
(ln O) D	– .1695					
	– (2.3687)					

Continued –

Table 8 – *Continued*

	Samples					
	1	2	3	4	5	6
R^2	.8397	.8394	.9421	.6985	.8775	.8791
n	119	201	102	99	17	58

[a]The output elasticities for the owner-operated farms are given by the α_i's, and the corresponding output elasticities for the share-cropped farms can be calculated as the sum of the α_i's and B_i's. The associated t-values can be estimated as: t-value $(\alpha_i + B_i) = (\alpha_i + B_i)/(\text{Var}(\alpha_i) + \text{Var}(B_i) + 2\,\text{Cov}(\alpha_i, B_i))^{1/2}$.

[n]Indicates the number of observations.

Figures in the parentheses are the estimated t-values.

[D]Is a dummy variable which assumes value of zero and unity for owner-operated and share-cropped farms, respectively. In column 6, it assumes value of zero and unity for unirrigated and irrigated share-cropping farms, respectively. It is included without taking its log, because log of zero is infinity.

and output prices.[3] We have found in this study that share-cropping and owner-operated farms are represented by neutral production functions in the sample of 201 pooled, 102 irrigated, and 99 unirrigated farms. But only the sample of 102 irrigated farms exhibits constant returns to scale. Therefore, it is not possible to attempt a rigorous comparison of the allocative efficiencies of the two groups of farms. However, in this case it may be meaningful to compare them due to a number of reasons. First, the farms are classified on the basis of tenancy and not on the basis of an input (i.e. land, labour, etc.). In this case the constant returns-to-scale does not remain very restrictive. Second, both groups of farms exhibit decreasing returns to scale. Third, the configuration of input and output prices facing the two groups is the same. The fact that the two groups of farms, in the sample of 119 aggregate farms and 17 totally unirrigated farms, are represented by factor-biased technologies still remains, and it will have strong impact on the allocative efficiencies of the two groups of farms. Therefore, in case of at least these two samples, results will reflect both technical and allocative efficiencies and not the latter alone.

[3]The data used in this study an a cross-section of farms from a single state. Therefore, there may not be wide variations in input and output prices across farms. But still some variation in prices may exist due to variation in distances between the farms and the markets. This can be expected to be randomly distributed across farms, and there is no reason to believe that this will be biased against one group of farms or the other. However, there is some feeling that the share-cropping farms suffer relatively more from working-capital constraint. Since cash is necessary for all purchased inputs, it can undermine the assumption of "same" input prices for the share-cropped and owner-operated farms. Therefore, the differences in the 'effective' relative input prices could explain some of the differences in the input use between the two groups of farms.

The tests for the allocative efficiency are performed by deriving the following equation for the Cobb-Douglas production function:

$$MVP_{ij} = \alpha_{ij} \frac{(Q_j)}{X_{ij}} P_{oj} = k_{ij} P_{ij} \quad i = 1, \ldots, 6, \text{and } j = 1, 2 \quad \ldots (3)$$

where MVP_{ij} is the marginal value productivity of ith input in the jth farm group, α_{ij} is the output elasticity of ith input in the jth group, Q_j is the geometric mean of the gross value of farm out of jth group of farms, X_{ij} is the geometric mean of the ith input in the jth group, P_{oj} is the price of output for the jth group, k_{ij} is the allocative efficiency parameter of the ith input of jth group, and P_{ij} is the geometric mean of the input price of ith input of jth farm group.

In this study the dependent variable, the gross value of farm output, is measured in rupees. The inputs other than land and labour are also value concepts measured in rupees.[4] Land is measured in hectares and labour in days per annum. Therefore, the marginal value products and marginal products will be equal in this analysis, and provided the two groups of farms face the same configuration of output and input prices, the k_{ij} values for inputs (except land and labour) can be calculated as:

$$\alpha_{ij} \frac{(Q_j)}{X_{ij}} = k_{ij} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

The appropriate α_{ij} values were taken from Table 8, and our estimates of marginal productivities and allocative efficiency parameters are presented in Table 9.

The resource (input) is over-utilized if $k < 1$, and under-utilized if $k > 1$. Absolute allocative efficiency requires that $k_{ij} = 1$, for all inputs. The two groups of farms would have achieved equal allocative efficiency if $k_{i1} = k_{i2}$, for all inputs. The results in Table 9 show that both share-cropping and owner-operated farms make very intensive use of labour, but under-utilize all other inputs in almost all of the cases. The other important result is that the share-croppers make even more intensive use of labour than the owner-operators make. Furthermore, the share-croppers depart relatively less from the allocation efficiency criteria than the owner-operated farms in the use of land, and "other expenses". But the contrary is true in the use of fertilizer, irrigation, and capital. Therefore, neither group is consistently more efficient than the other in using all of the inputs.

[4]The value measure of output and inputs can be expected to take care of the quality differences among farms to a great extent. The value of gross output is calculated at prices actually received by every farm for its products. Therefore, it takes account of the "price efficiency" of the farms.

Table 9

Allocative Efficiency Coefficients (k_{ij}'s) of Owner-Operated and Share-Cropping Farms

Sample No.	Sample	Tenure of Farms	Allocative Efficiency Coefficients (i.e. K-Values)					Other Expenses
			Land*	Labour*	Fertilizer	Irrigation	Capital	
1.	119 Aggregate Farms	85 Owned	0.92	0.42	2.30	2.35	2.27	5.49
		34 Share-cropping	1.19	0.35	6.15	4.33	2.79	1.08
2.	Sample of 201 Pooled Farms	143 Owned	1.50	..	4.19	15.83	4.17	3.24
		58 Share-cropping	1.46	..	4.23	22.45	5.44	1.39
3.	102 Irrigated Farms	75 Owned	1.86	0.36	0.65	2.58	2.11	2.52
		27 Share-cropping	1.04	..	16.11		8.47	1.79
5.	17 Totally Unirrigated Farms	10 Owned	0.86	0.66	0.83		..	5.25
		7 Share-cropping	0.75	0.52	27.85		..	2.09
6.	58 Share-cropping Farms	27 Irrigated	1.78	..	1.58	5.95	3.27	0.95
		31 Unirrigated	1.41	..	16.23		5.04	0.97

Continued –

Table 9 – *Continued*

. . Indicate that marginal productivity, from which this allocative efficiency coefficient has been calculated, is non-significant at 10 percent level.

The standard errors for the marginal productivities are estimated as follows: $(\text{Var}(\alpha_i)\ (\hat{Y}/X_i)^2)^{1/2}$ where, $\hat{Y}$ is the estimated output by keeping inputs at their geometric means; and X_i is the geometric mean of ith input.

*k_{ij}'s for land and labour have been calculated by dividing the marginal productivities by the corresponding unit input prices.

V. BRIEF SUMMARY AND CONCLUDING REMARKS

The results seem to suggest that even in 1969-70, most of the farmers engaged in share-cropping were relatively small and had relatively smaller gross income from their owned area. Exactly fifty percent of these farmers had (obtained) negative net income from the area they actually share-cropped. Therefore, it looks that most of these farmers engage in share-cropping to generate enough income to meet the reasonable needs of their families rather than to maximize the profit. However, there is evidence that relatively larger farmers also engage in share-cropping, and it can not be ruled out that at least some of them practise share-cropping with the objective of maximizing profit.

There is some evidence from this study that the technical efficiency of the share-cropped farms is lower than that of the owner-operated farms in case of some of the samples. There is significant allocative inefficiency on both groups of farms. But there is no definite advantage for one group over the other in case of every input. Above all, there does not seem to be any inherent inefficiencies in what we have called "voluntary share-cropping system". The uncertainty about the continuity of the share-cropping arrangements for more than one crop year is caused by the tenancy legislation rather than by the share-cropping itself. Share-cropping makes quite intensive use of labour. This has important implications for a labour-surplus economy like India. Lower use of fertilizer, irrigation, capital, and "other expenses" most probably indicates the inadequacy of cash available to the share-croppers. We found that in 1969-70, the so called landlords did not contribute much towards the expenses of purchased inputs. Therefore, if they will contribute more towards the purchas of these inputs most of the noticed differences in the two systems may be further reduced or even eliminated. There is evidence that the participation of landlords has increased more recently [2].

There is no significant exploitation of the share-croppers by the landlords, at least in India [2, p. 292]. On the contrary, in the absence of gainful off-farm employment opportunities for the small farmers, share-cropping provides much-needed supplementary income for their families. Therefore, the "voluntary share-cropping system" is not inherently bad, and it is not a static institution as most of the theory assumes. Given its voluntary nature, it is highly likely that in future it will evolve into a mutually beneficial institution for both the share-cropper and the so called landlord.

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